COLLEGE OF AGRICULTURE
UNIVERSITY OF WISCONSIN

FARMER'S DIGEST

AUGUST–SEPTEMBER, 1945

Volume 9 — 25c a Copy
No. 4-5 — $2.00 a Year

The World's Strangest Garden	*Farm Journal & Farmer's Wife*	1
Let's Consider Cultivation	*Pennsylvania Farmer*	5
Clean Your Barn Electrically	*Rural Electrification News*	8
Maximum Production	*Hog Breeder*	10
Now You Can Hire a Soils Contractor	*Missouri Ruralist*	12
Arizona's Wonder Grass	*Soil Conservation*	16
Handling Farm Help	*The Michigan Farmer*	20
Soil Fertility Lost in Burning Over Forests	*West Plains Journal*	23
Pasture Fertilization	*The Shorthorn World*	26
New Mexico Sheep and a Professor	*Western Farm Life*	28
New Organic Fungicides	*Pacific Rural Press*	31
Protein for Pigs on Pasture	*American Feed Trade*	33
Lambs Put O. K. on Silage	*Farm Science Reporter*	38
Effect of Age on Weight-Production of Range Cows	*The Cattleman*	40
Insulate for Comfort	*American Poultry Journal*	45
Poison Ivy and Its Eradication	*New England Homestead*	47
Forced-Air Curing of Field-Chopped Hay	*Capper's Farmer*	50
Keeping Up-to-Date on Blackhead	*Turkey World*	52
The Using Horse of the West	*The Horse*	58
Raising Calves at Mare Island	*Holstein-Friesian World*	62
"Hormone" Sprays for Greenhouse Tomatoes	*Market Growers Journ.*	68
The Future of Poultry Breeding	*New Jersey Farm and Garden*	72
A Pound of Grain for 10.7 Lbs. of Milk	*American Agriculturist*	76
Phosphorus and Plant Nutrition	*California Cultivator*	80
Trees for Prosperous Agriculture	*The Ohio Farmer*	82
For the Farmer's Library		85
Index		87

The Farmer's Digest

EDITORIAL STAFF:

Editor—L. Bush-Brown Assistant Editor—C. Leavitt Dye
Business Manager—A. E. Heick
Associate Editors—
John A. Andrew, Jr., James Bush-Brown, Ruth Patrick

ADVISORY EDITORIAL STAFF:

William A. Albrecht
Chairman, Department of Soils
University of Missouri

John D. Beck
Professor of Veterinary Medicine
University of Pennsylvania

Hugh H. Bennett
Chief, U. S. Soil Conservation Service

D. B. Johnstone-Wallace
Assistant Professor, Department of Agronomy
Cornell University

H. J. Reed
Dean of the College of Agriculture
Director of the Experiment Station
Purdue University

W. T. Spanton
Chief, Agricultural Education Service
U. S. Office of Education

Howard B. Sprague
New Jersey Agricultural Experiment Station

M. L. Wilson
Director of Extension Work
United States Department of Agriculture

The Farmers Digest
Published Monthly at Ambler, Pennsylvania
by the Farmer's Digest, Inc.

25c a Copy *1 Year $2.00*
2 Years $3.50 *3 Years $5.00*
Foreign and Canadian Subscriptions $2.50 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879

The Farmer's Digest

Volume 9 August-September, 1945 Number 4-5

The World's Strangest Garden

Condensed from Farm Journal and Farmer's Wife

Carroll P. Streeter

I HAVE just seen one of the strangest gardens on this earth.

The place is Ascension Island —the top of a volcano that was pushed up through the wastes of the South Atlantic Ocean, midway between South America and Africa, just below the equator. Only five by seven miles in size, it is one vast ash heap. Just clinkers, dirty and utterly spent, except for one surprising oasis at the top of Green Mountain, the island's highest peak.

Picture, if you can, lush tomatoes, cucumbers, radishes, lettuce and peppers growing right out of pure cinders. This cinder garden produces enough to feed 2,000 American soldiers some fresh vegetable every day of the year. Sometimes two a day. Until the first harvest, which I saw May 1, there were soldiers on Ascension who hadn't eaten a green vegetable for two years. No refrigerator ships had been available, and the island had no soil to raise anything.

The secret of this miracle is hydroponics—the fancy name for growing crops in chemical solutions without soil.

For 75 years the subject of experiment, hydroponics have become a profitable commercial operation in the United States, and they are certainly a success on Ascension. These vegetables are being raised cheaper in the cinders of Ascension than they can be bought in Washington, D. C. —not to mention shipping costs.

These vegetables look, and taste, like any others, and according to careful experiments they contain as much nourishment, including vitamins, as crops grown in soil.

Let's take a look at the island, and see why we have American soldiers there.

To reach Ascension our party of magazine editors and newsreel men were flown by the Air Trans-

Reprinted by permission from the Farm Journal and Farmer's Wife, Philadelphia, Penna., June, 1945

port Command in freight cargo ships and Liberator bombers for a solid 34 hours from Miami. (From Philadelphia the round trip was 13,000 miles, and we were gone nine days, counting layovers.) By night we jumped to Puerto Rico and on to Georgetown in British Guiana, South America, sleeping as best we could on the floor of our flying boxcar.

Next day we sailed over 2,000 miles of jungle, broken only by muddy, meandering rivers and the huge delta of the Amazon (which looked like so much thick mud soup). Reaching Natal at the eastermost tip of Brazil that night, we set out at 2 a. m. for Ascension, a microscopic speck 1,433 miles out in the dark to the east somewhere.

"We can't miss it," our pilot assured us. "There's nuthin' else out there anywheres near it." Some pilots *have* missed it, or have encountered stiff headwinds and fallen short.

But practically every pilot does make it, and so did ours. Along toward noon we saw Ascension off in the distance, a collection of forty hills, some red, some gray, some black, and in the midst of them Green Mountain, its top partly hidden in the clouds.

At the edge of the island was a single landing runway stretching back between two hills. (One runway is enough here, for the wind blows day and night at 15 to 20 miles an hour, and always from the southeast.) As they roar down between those two hills, big planes have only about 50 feet clearance at either wing tip. That's one runway a pilot wants to hit straight on. Planes never land on it after dark.

Perched here and there in the wilderness of clinkers are the soldiers' tents. The only permanent settlement is Georgetown, a British village down the shore a couple of miles, populated by 26 men (all employes of the British cable station), with 12 wives, eight children, and one spinster. The British have been there since 1815, but the island was discovered by a Portuguese on Ascension Day, 1501.

Oldest residents of all are the multitudes of sooty terns (or "wideawakes") and huge sea turtles, some of the latter weighing 500 pounds.

Most incredible spot on the island is the top of Green Mountain. Rainfall on the lower island is only six inches a year, but the mountain keeps its nose in the clouds much of the time, condensing dew and rainfall to a total of 30 inches a year. Through the centuries this moisture has decomposed the rock into real soil. The British have imported exotic trees and shrubs from all parts of the world, and have

made the top of the mountain into another Garden of Eden—a spot out of this world.

The British Governor and his wife, with a few St. Helenian families imported to do a bit of farming, live on a shelf near the summit. Nothing but a burro or a jeep can get up there, and some of the hairpin turns are so sharp that a jeep has to back up and make a second run for it.

Today Ascension Island is the crossroads of the South Atlantic. Planes arrive from east and west every day. It is doubtless the most important ash heap in the world.

When the British were hard pressed by Rommel in Africa it became imperative to get supplies to Montgomery, and at once. The Mediterranean was blocked. Airplanes could carry little cargo because the hop was too long. But right out in the middle of the ocean was this stepping stone if it could be used. British engineers said flatly that no airfield could be built there. American engineers built it in 90 days.

Montgomery got fighter planes, and even ammunition for his tank guns, just when Rommel was sure he could get neither. Ascension Island thus played a big part in winning the battle of El Alamein, and turning the course of the entire war. Today it is in a stop on the heavily-traveled air highway from Miami to Natal to Africa to India to Burma to China.

The American garrison on Ascension Island gets fine food, but until now has had no fresh vegetables. So the Air Quartermaster's department in Washington hunted up an expert who had made a commercial success of hydroponics for years. He was Kendrick W. Blodgett, of Terre Haute, Indiana, manager of the largest greenhouse in the United States. He went to Ascension to see what could be done. The Air Corps was combed for a dozen expert helpers—greenhouse men, agricultural college graduates, farmers, and a North Carolina County Agent. One is Blodgett's own son.

Army engineers built the layout, now the largest outdoor hydroponic set-up in the world, covering 80,000 square feet (30,000 in the beds themselves). It consists of 25 beds dug into the ground, each 400 feet long and 3 feet wide, with paths between. Each consists of an asphalt-cement trough 8 inches deep, and nearly filled with black cinders about a quarter-inch in size.

The cinders are the mechanical support for the plants. They get their food from a solution of nitrogen, phosphorus, potash, manganese and calcium, made with distilled sea water. The cinders themselves furnish enough

of the "trace elements." Every other day this solution is poured to within an inch of the top of the cinders. Seventy per cent of it drains out and is used again.

Seeds of radishes and lettuce are planted right in the cinders. The tomatoes, cucumbers and peppers are propagated in real dirt (brought from the mountain), and transplanted to the cinder beds. A windbreak of canvas has been built to slow up evaporation, and the area is shaded with cloth strips overhead. A hive of bees was flown in from Brazil to pollinate the cucumbers.

Even on this ash heap in the middle of an ocean there were insects and other pests to devour the vegetables the moment they appeared. Doubtless they descended from the British garden on top of Green Mountain, but how they scented this new fare from afar nobody knows. Tomato worms, thrips, white flies, leaf rollers, crickets, and even mice and wild jackasses—Blodgett had to fight them all. He set traps for the mice, but the crickets ate the cheese bait.

Blodgett doesn't know what the Ascension layout cost. Soldier labor was used. Back in the United States the cost usually runs from $8,000 to $10,000 an acre.

The army now has two smaller chemical gardens on Pacific islands, and an experiment station at Coral Gables, Florida. Some day there may be such miracle gardens in rocky, soil-less spots all over the world.

For Mow-Cured Hay

Hay at Michigan State College was put into the barn immediately after cutting and was dried by a fan which forced air thru specially constructed ducts in the mow. After practically a year in storage it was found to be of excellent color and texture and completely free of mold. It averaged 400 cubic feet to the ton, which is 50 feet less space per ton than is required for well-seeded, mixed, field-cured hay. From these results college authorities conclude that artificial curing is well adapted to Michigan conditions.

This new method of drying high-moisture hay in the mow works with chopped hay, too, according to University of Wisconsin trials. Chopped clover hay that contained 45 percent moisture (meaning not much more than well wilted) came out of the mow in fine shape. A combine engine was used to operate the fan because it has more power than electric motors on most rural lines, and because heat given off by the engine can be driven thru the hay.

Let's Consider Cultivation

Condensed from Pennsylvania Farmer

J. B. R. Dickey

Weeds in crops steal moisture and plant food. They crowd and compete with the plants we want and occasionally take over completely. Controlling weeds in intertilled crops is essential. Tillage tools, in these days of scarce labor, are the only practical means of weed control. Such being the case tillage operations, at least after the seed bed is prepared, should be aimed at weed control.

In spite of the nice theories regarding aeration of the soil, promoting deeper rooting and conservation of moisture through a surface mulch, experiments on corn and potatoes have proved that just as good crops could be produced, at least in some soils, where the weeds were simply scraped off, or cut off, with a sharp hoe, as where the normal number of cultivations were given the crop. Perhaps the cultivation was beneficial in other ways, but if so this was counterbalanced by the harm it did to the roots of the crop. More frequent cultivation than was normally needed for weed control usually reduced the yield in these experiments, and deeper than normal cultivation also reduced it. Special soil and seasonal conditions may make other factors important but there is little or no scientific or experimental backing for a lot of popular ideas. If weeds are the main enemy why not plan the campaign so as to hit them when they are weakest, never give them a break and at the same time save ourselves any wasted time or effort?

There are in general two types of weeds in tilled crops, annuals and perennials. The perennials come back mainly from broken pieces of root, as in quack grass and bind weed (morning glory) or from runners below plow depth as in Canada thistle. These perennials have more lives than a cat and need to be knocked off repeatedly to exhaust the nutrients stored in the fleshy root. Sometimes the best plan with the perennials is to plow late and plant at once, in an attempt to get the crop well away before the weeds get back to the surface. Cultivation seldom kills perenials, but wise management helps a lot to keep them under control.

It is the annual weeds, however, which are the universal

Reprinted by permission from the Pennsylvania Farmer

enemy. They come each year from seed, and even if we try not to let them mature, the soil always seems to be full of their seeds. We plow them down and plow up another batch. Each rain germinates a crop of them, and the cultivation which kills these brings more to the top where they can start with the next rain. The best time to kill annual weeds is as soon as you can see them and before they are noticeable. All that is necessary then is to break the crust and sever them from the moisture below.

Tillage and seed bed preparation should follow rain as soon as the ground is dry enough. We often see farmers harrowing or cultivating fields where the soil is already loose and dry. They roll the clods around, kick up a dust and bring moist soil to the surface where it dries out, but there are no weeds to kill and if they are doing any good it is often hard to see what it is.

Making the fullest possible use of the spike harrow and weeder after crops are planted and until they are quite large will take the place of a lot of the time consuming, early row cultivation. In fact good clean crops of corn and potatoes have been grown with no row cultivation, or at most with only one or two, provided the soil was not too much compacted by heavy rains and so required deeper working between the rows to permit the weeder to loosen the soil in the row effectively. If harrowed only in the afternoon on bright days, when the moisture in the stem is relatively low, it is surprising how much rough treatment of this sort quite large corn and potatoes will take without serious damage. A few plants knocked off will be better than a lot of big weeds in the row, the plants on each side will at least partly make up for the misses, and there is an old saying that the worst weed in a corn field is too much corn.

In the case of potatoes, where the soil between the rows has been compacted by heavy planter and tractor wheels, it may be well to make the first cultivation deep in order to loosen things up to aid the penetration of roots and moisture. With a properly prepared, loose seed bed, however, there is no object in going close, and the fertilizer in bands along the row should never be disturbed by the cultivator if it is to do the crop the most good. After the plants are well started every effort should be made to avoid tearing off roots. Tractor operators seem to be prone to a fondness for ripping things up deep and making the dirt fly by going entirely too fast. Some of them boast about going so close to the row that they move every plant as they go by. It is easy to

visualize what this does to the roots which are essential to the proper feeding of the plants. After such a working the field can often be seen to wilt down and the yield will be reduced by many bushels, especially if the weather following is dry. Don't send the boy or the hired man out alone with the tractor to cultivate. Go along and show him, and see for yourself, where the roots are and what thoughtless work may do to them. Many last cultivations were better not made at all.

By the time corn is a foot high the roots will be out to the middle of the row. Most farm soils are none too deep and most of the available plant food is in the surface soil. The plants should be allowed to fill this surface soil as completely as possible with forage roots which in a good open soil will go deep into the subsoil in search of moisture as the surface dries out. There is little or no proof that deeper root development can be promoted by ripping off a lot of roots foraging in the rich soil between the rows, and efforts to do so certainly are dangerous.

It seems strange how many farmers still stick to the old style, straight sided cultivator shovel. To completely break up the surface and dig out the weeds such shovels must often be run pretty deep with consequent root damage. A great improvement is the broader, diamond shaped shovel now put on many tractors. Where there are not too many stones wing shovels or sweeps are still better. These definitely cut off all the weeds, especially the tough perennials like thistles and bindweed which are apt to slip through the old style teeth. Sweeps cannot often be run deep enough to do much damage and are particularly good for the later workings. They also leave the middles almost level instead of each with a furrow left by the last shovel for the water to run down and start a wash. Where one wants to get up rather close a pair of "half sweeps" can be used next the row. Sweeps are available at almost all supply stores.

Ridging up of the rows may sometimes be necessary but should be regarded as undesirable from most standpoints. Ridged crops will suffer more in dry weather. If weeds get a start in the row throwing some soil over them may help, but seldom does unless extreme measures are used. Ridging reduces the pushing out and sunburning of potatoes and most good growers practice it to some extent. It is more necessary where potatoes were not planted as deep as they should have been and consequently set high. Ridging also makes digging some-

what easier. Somewhat deeper cultivation is of course necessary where ridging is to be practiced. If needed the ridge should be rather broad and low, not high and narrow. As with other farm operations the cultivator must use his head and not try to follow any set rules.

Clean Your Barn Electrically

Condensed from Rural Electrification News

CLEANING barn gutters — a tedious and unpleasant hand task—can be done electrically. Experimental work in three states shows that the farmer can do other chores as his power-driven conveyor collects litter from the gutter behind the cows, slowly carries it the length of the barn, elevates it and drops it into a manure-spreader outside. Power costs are low, and costs of installation depend largely on type of equipment used.

Of course, the gutter conveyor does not perform the entire cleaning job. Scattered droppings still have to be scooped or swept into the gutters, necessitating a certain amount of hand labor. However, mechanical cleaners eliminate much of the hardest work.

Barn cleaners are not yet widely used, but 20 or 30 cleaners on Wisconsin, Michigan and Illinois farms are proving so efficient that a big demand is being forecast for both factory-made and home-devised cleaners.

Three types of cleaners are in experimental use on a number of farms: the rectangular conveyor cleaner, in which an endless belt moves steadily around the barn gutters, making a complete circuit of the barn and dropping the litter into a pit or manure-spreader; a type in which the conveyor winds itself on a drum at the end of each trip and is unwound and replaced in the gutter before another cleaning begins; and another endless conveyor system, in which the gutter is built with a false bottom to allow room for the return trip of the belt. This requires a separate conveyor on each gutter instead of a continuous belt all the way around.

A fourth type, a semi-automatic, heavy iron scoop moves along the gutter by electric power, guided by a man who pulls it back to the starting point after each trip, has also been installed.

Richard L. Witz and Arthur J. Bell of the Michigan State College experiment station have

Reprinted from Rural Electrification News, Washington, D. C.

made extensive studies of gutter cleaning methods. Here are some of their findings:

A manufactured cleaner, installed in the barn, costs about $500 on the average. The total annual cost of use, including depreciation, repairs and electric power, should not exceed $100. Thus, the cleaner can pay for itself by saving 200 hours of labor annually at 50c per hour. One farmer reported that his cleaner saved him 440 hours of hard work in one year.

First cost for a simple home-built cleaner averages $50, not including the cost of the farmer's labor.

One 2 h. p. motor is usually strong enough to operate the cleaner at an average rate of 30 feet per minute. The drum-winding cleaner requires two motors—one to pull the heavily-laden belt along, and another smaller motor to return the belt to its starting point. In some installations of the endless conveyor type the motor is placed in the loft and the power brought to the belt through a geared shaft.

Wisconsin farmers are enthusiastic over the barn cleaners now, partly because of the Wisconsin Extension Service Farm Machinery Caravan, which has been displaying models of barn cleaners in 40 counties.

Fertilizers Hold Over

What is the "carry-over" value of fertilizers? Naturally it varies with the soil, moisture, and kind of crops raised, but in most cases it is surprisingly high. Here are two typical examples:

Five years after Mississippi researchers put 400 pounds of 20% superphosphate per acre on hillside pastures, the grazing yield was still *22%* greater than on untreated pasture in the same field. The first year the yield was nearly doubled. What's more, the stock preferred the fertilized part, grazing it first.

Barnyard manure also gives carry-over benefits. In Nevada tests, manure applied before corn brought increased yields throughout a five-year rotation. The manure, put on at the rate of 15 loads (30 cubic yards) an acre, boosted corn-for-silage 2.3 tons an acre, barley 18 bushels, and alfalfa hay yields (three years) 1.1 tons per year. The manure also checked wind erosion.

Figuring present prices for the extra crops, each load of manure was worth about $6.50.

However, one shot of fertilizer in five years, while better than none, is not recommended. The most profitable agriculture requires a full ration of plant food for each year of the rotation.

Farm Journal and Farmer's Wife

Maximum Production

Condensed from Hog Breeder

SUCCESSFUL pork producers, almost without exception, consider the number of pigs weaned per sow as one of the most important measures of success.

True enough they are concerned with the type of their foundation animals (particularly as an indication of feeding ability), the rate of gain after weaning, and weight at 6 months, but it usually boils down to "how many pigs did she raise."

That adds up to the fact that the efficiency of the herd is measured by the prolificacy and suckling ability of the sow and by the rate and economy of the gain of the pig.

Just how right these practical hogmen are in emphasizing large litters raised is well illustrated in the University of Missouri's valuable Bulletin 461, "Some Factors Influencing Efficient Production of Sows," written by L. A. Weaver and Ralph Bogart.

The bulletin can be summarized as follows:

1. Within limits (9 to 13 pigs), an increase in size of litter does *not* result in a decrease in average weight per pig at weaning.

2. There is a direct relationship between weight of pig at weaning, feed-lot performance after weaning and, consequently, weight at 180 days of age.

3. With large litters there is less feed (and overhead costs) required to produce 100 pounds of marketable pork.

4. Gilts selected from efficient producing sows inherit productive ability. In fact the evidence indicates that close selection is necessary to even maintain the level of productivity in the sow herd.

Influence of Weaning Time Weight of Pig Upon Future Feedlot Performance

Weaning Weight Groups	Weaning Weight	Gain Per Day	Weight at 6 Months of Age	Age When Weight Equalized 225 Pounds
15-20 lbs.	16.9	1.4	189.6	214 days
20-25 lbs.	22.2	1.4	196.0	209 days
25-30 lbs.	27.2	1.4	202.8	200 days
30-35 lbs.	32.1	1.4	208.8	192 days
35-40 lbs.	36.7	1.5	218.5	181 days
40-45 lbs.	41.7	1.5	228.2	176 days
45-50 lbs.	46.8	1.5	233.9	171 days
50-55 lbs.	52.9	1.6	254.0	160 days

Reprinted by permission from the Hog Breeder, Chicago, Illinois, May, 1945

Heavy Birth Weights Desirable

Pigs that are large and vigorous at birth grow more rapidly and weigh more at weaning time than pigs with light birth weights. One-pound advantage in size of pig at birth resulted in about a 7-pound advantage at weaning time. The gain per day was therefore directly associated with size of pig at birth.

Importance of Weaning Weight

Rate of growth from weaning until the pig is marketed is important because the pigs that grow fastest usually do so most economically. Also, the more growthy pigs require a shorter time to produce market hogs and thus reduce labor, risk and similar expense.

Size of the pig at weaning is a reflection of both the capacity of the pig to grow and the ability of the sow to produce a liberal supply of milk.

Pigs do not normally eat much grain feed until they weigh 20 pounds or more, regardless of age at which this weight is reached. With extremely growthy pigs this weight may be attained in 3 weeks of age, while slow gaining pigs may weigh no more than this when weaned (8 weeks). Thus, the pig that is very small at weaning age may have difficulty in adjusting itself from nursing to eating grain, whereas the large pig at weaning is accustomed to eating and experiences little or no setback from weaning.

There is a direct relationship between gain per day after weaning and weight at 6 months of age with size of pigs at weaning time.

The accompanying University of Missouri experimental data is conclusive on that point.

Because of the greater weight at weaning and the larger daily gains, the heaviest pigs at weaning reached 254 pounds at 6 months of age, while the smallest pigs at weaning weighed only 189 pounds at 6 months.

Length of Feeding Period

The table below shows that large pigs at weaning time require less time to reach a market weight of 225 pounds than smaller ones, both because they have less gain yet to make, and their daily gains are greater.

Growthy pigs should reach a market weight of 225 pounds at 6 months of age. To attain this goal, pigs in this experiment had to weigh at least 35 pounds when weaned. The smallest pigs in this study required 54 days longer to reach the same market weight than the largest pigs at weaning.

Difference Between Littermates

Largest and smallest pigs were selected from each of 15 litters and were fed identically. Though the group of inferior pigs had the same parents and were handled

under the same conditions as the larger pigs, the difference in the performance between the two groups is almost unbelievable.

Biggest pigs from each litter weighed 34.9 pounds at 8 weeks; 197 pounds at 6 months, and required 198 days to reach 225 pounds. Smallest pigs for each of the 15 litters averaged 18.4 pounds at 8 weeks; 130 pounds at 6 months, and required 286 days to reach the 225-pound mark. That is the final proof of the correlation between weaning and 6-month weights.

Now You Can Hire a Soils Contractor

Condensed from Missouri Ruralist

NEW figure on the Missouri farm scene of recent years is the soils contractor. Men with specialized earth-moving equipment have set themselves up in the business of building terraces, grass waterways, outlets, ponds and other soil-saving structures for farmers either too busy to do their own work, or farmers who feel that these soil saving specialists can do a better job.

One such soil-improvement contractor, Alva Mix, of Boonville, Missouri, now is offering a still newer service — water-management planning. Such a plan includes the location of terraces, terrace outlets, diversion terraces, silt basins, soil-saving dams, and pond sites, all drawn on a detailed farm map.

Mr. Mix served several years as a county Extension agent in Cooper and Schuyler counties, and now is tying in his soil-contracting work with his experience in Balanced Farming and farm-management practices recommended by the Extension service.

Employing Mr. Mix to make a water-management plan for a farm is much like hiring an architect to draw a blueprint before starting actual construction of a building. The completed plan enables the farm owner to see his farm as a whole and to tie in his individual terraces, outlets and ponds into a complete system in which all rainwater that falls on his land is held in check and carried off the farm in an orderly fashion.

There is no doubt today that farming is one of the most scientific businesses in which a man can engage. And none of the farm sciences has advanced more than the science of soil saving. A whole new concept of mechanical structures to hold down erosion

Reprinted by permission from the Missouri Ruralist, May 12, 1945

losses has developed in recent years.

Terraces built as recently as 10 years ago often may be out-of-date now. The concept of the use of farm ponds has greatly changed. The grass waterway and the soil-saving dam have been developed and remodeled in line with experience of years.

One new-type structure is the diversion ditch which carries run-off water concentrated by terraces in man-made channels instead of nature's paths. Silt basins are another type structure appearing in more water-management systems.

One of the really good ideas developed from experience in terracing is planning these structures so they need never be crossed in farming operations or in travel to and from fields. Sometimes this requires shifting of a few field boundaries, but in most cases plans can be worked out that prevent crossings of either terraces or outlets with machinery or livestock.

It is small wonder then that the average farmer does not now feel up to the job of laying off his farm with soil-saving structures. The "know-how" of planning such structures now requires specialized science.

It is this "know-how" with a background of experience that Mr. Mix is offering as a new service. No doubt there will be others in the state to offer such services, just as the "contract terraces" sprang up almost overnight.

Of course, there are various governmental agencies that offer free advice in soil conservation. County agents long have been of invaluable aid to farmers. The Soil Conservation Service has a corps of technicians and hopes to have more when the soil districts are in operation.

But there probably always will be a place for the soils engineering consultant who can be hired by anyone. For one thing, the services as now offered by Mr. Mix, as an example, are more complete than other sources can offer. The county agent could scarcely afford to spend the time on individual farms required for planning the water-management system in detail. The time seems far off, too, when the Soil Conservation Service could blanket the country with technicians and supply all the demand for soil-structure planning.

A look at some of the maps planned by Mr. Mix, and also some of the farms receiving "treatment" for erosion ailments, reveals some of the newer ideas in water-management planning.

One of the first things to get special notice is that every square foot of the farm gets attention from Mr. Mix in his plan. Or rather, some provision is made to

handle the rain that falls on every square foot of land. Quite often the easy solution to a "problem field" is just to let it alone. "We'll put that field in grass" is one easy way out when planning a farm, or if it is severely eroded it often is designated as a forest area.

Mr. Mix makes most of his plans to turn the entire farm into productive fields that can be cultivated. Of course, there sometimes are small areas that almost defy economical planning, and so are left as wildlife areas. These are kept to a minimum.

Two features are followed to make the mechanical structures convenient for farming operations. Whenever possible, waterways are built along the edge of the farm—so they need never be crossed. And to allow access to land between terraces are grade divides—"thank you mom's"—Mr. Mix terms them.

Of the 2 features, the first is the difficult one to achieve. Sometimes waterways, which are sodded strips with berms or dams on each side, to carry off the water collected from terraces, appear to go up hill. Actually water is taken around small inclines by diversion channels and emptied into the waterways when a downhill slope is available again.

Another device sometimes is used in connection with waterways and outlets—the silt basin. These are small pond dams which are designed to fill up with silt and thus elevate the water into a diversion channel or waterway. They are especially useful when water from unprotected neighboring land empties into your farm.

Mr. Mix is making his charges for his new service on an hourly basis. The farm owner pays so much an hour for the time spent in travel to the farm, in the actual survey work, and for the time spent in drawing up the completed map.

Equipped with the finished plan the farm owner can either do the work himself or hire a soils-improvement contractor. Mr. Mix is, of course, in the latter business.

The decision as to whether a farmer should hire his work done lies completely with him. Certainly circumstances alter the situation in that no 2 farms offer the same problems.

A study of the terracing and other similar work done in the state suggest that in general the easiest work has been done first. Some farms adapt themselves to terracing—others do not. On some land the problem of waterways and outlets seems almost without an answer. On other land getting rid of the terrace water is relatively simple.

Most difficult situation is the long slope. Not only do terraces

need to be long, but the waterways then present serious problems. Waterways that drain only a few acres need not be so large, but Mr. Mix has run across instances in which waterways must drain 80 to 100 acres—sometimes more. Such waterways must be wide so the torrent of water collected from such a large area will not wash out the sod and dig gullies in the waterway.

Waterways that must be 50 to 75 feet wide on sloping land require a lot of earth to be moved to make the bottom of the waterway level. Often fills must be made and such work is costly.

Terraces built across great gullies also require huge amounts of earth moving. The cost of working over such fields is much higher than working over fields with short slopes that have been well cared for.

A look at waterways and terraces built by Mr. Mix on such "problem farms" would convince most farmers that more engineering is required than can be done with a plow and a scraper. Here is where the "dozer" and other specialized earth-moving machinery is a must.

The cost of saving some of these farms that present so many difficulties is necessarily high. High in relation to costs on other farms presenting fewer problems. But the fact is that Missouri is filled with the more difficult farms. And farms with long slopes have suffered most severely from erosion. Fortunately, they once were some of our most fertile soils.

The future of our agriculture lies in the solution of our soil-erosion problems. The soils-improvement contractors with their specialized knowledge and equipment no doubt will play a major role in solving these problems.

Broomsedge

Conversion of ruined land to alfalfa fields in one year's time has been accomplished in Guernsey County, Ohio, from both spring and summer seedings of alfalfa in the sedge-infested areas. Lime and fertilizer must first be added according to the lack of them shown by careful tests. Then the soil is thoroly disked instead of being plowed. Disking must be thoro enough to cut the broomsedge and work the litter into the surface soil. Three farmers in the county obtained good stands by seeding in April, and two obtained equally good stands by seeding in August. While the method is costly, it represents a change of almost worthless land to high producing property.

—*Successful Farming*

Arizona's Wonder Grass

Condensed from Soil Conservation

Robert V. Boyle

Regional Chief of Operations, Soil Conservation Service, Albuquerque, N. M.

ARIZONA has an "up and coming" grass that is a wonder. In a few years, practically anyone in the recognized ranching areas of southern Arizona can have grass.

Lehmann lovegrass is to the hot and semi-arid part of Arizona what crested wheatgrass (introduced from Siberia) is to Utah, Colorado and other states north and east of us. As a downright valuable forage grass and as a plant to hold the soil, Lehmann lovegrass is bound to be recognized more and more in the next few years. For these purposes, the South has kudzu, lespedeza, Rhodes grass, and the well-known Bermuda. It is fortunate that Arizona, too, has its wonder grass.

A small amount of seed of Lehmann lovegrass was obtained from the Union of South Africa through the Division of Plant Exploration and Introduction of the Bureau of Plant Industry. First plantings were made under irrigation on the Soil Conservation Service nursery at Tucson in 1934. These initial trials were so promising that larger seed-increase plantings were established in 1935 and succeeding years, and good crops of seed have been harvested each year. Adaptation trials have been made on representative range areas throughout the Southwest. It has been found that the grass dislikes cold winters and thrives only in a mild climate where the temperature seldom gets below 15 Fahrenheit.

It produces a luxuriant growth of leafage and seed. Cattle don't like it quite so well as grama when the latter is green. However, it greens up earlier and stays green longer than does grama, and therefore fits well into the picture. When growing along with browse, Lehmann lovegrass is relished by cattle and horses. It ranks along with grama and other common grasses as far as nutritive value is concerned.

The chief virtues of Lehmann lovegrass are: (1) *Ease of establishment.* It can be planted successfully where native grasses either fail to come up or are "rubbed out" by adverse conditions. (2) *It isn't choosy about*

Reprinted by permission from Soil Conservation, May, 1945, Washington, D. C.

soils. It seems to do about as well in sandy soil as adobe soil; rocky ground as alluvial valley. (3) *It is drought-resistant.* Even small seedlings pull through dry spells when native grass seedlings curl up and quit the game. (4) *It reproduces well.* Millions of viable seed are produced which can and do result in a fairly rapid spread. (5) *It stays green over a longer period of time than do the native grasses.*

These statements aren't made solely on the basis of the adaptation trial plantings mentioned above. This grass has passed even the field trial stage. Several years ago it was planted on 10 or 15 acres of slick bare ground at a windmill on the Babacomari grant belonging to Frank Brophy. It is definitely still there, doing well, spreading and being eaten. On the new highway between Benson and Willcox, Lehmann lovegrass is "taking over" the right-of-way. On Rancho Sacatal, near Douglas, W. E. Hollard had a strip of creosote brush ripped up and planted to the "wonder grass." The site was sloping, rocky, hot, dry, and devoid of all cover except for the brush. In a year's time it looked like a wheat field. Near Apache, in the southeast corner of Cochise County, Lehmann lovegrass has been holding down some abandoned dry farm land for the past several years. These are just a few samples. Similar results have been obtained on other ranches and highway rights-of-way.

Under what conditions will the planting of Lehmann lovegrass pay off. It does well practically anywhere that grass is sparse or non-existent and where the terrain is such that seeding equipment can be used. There are millions of acres where there is very little grass and where the only perennial vegetation is creosote bush, mesquite, black brush, burro brush, and the like. There are also many thousands of acres which once supported good stands of grama, but which, for one reason or another, now have little. While reseeding of grama on the plains of eastern New Mexico and Colorado is physically possible and economically feasible, the undertaking in southern Arizona is very hazardous. Lehmann lovegrass seems to be the answer on the semi-desert browse areas and on the denuded grasslands.

Everyone recognizes the importance of having a well balanced range; that is, one which isn't all browse or all grass, but one which has both browse and grass. While opinions may vary, few will argue that two-thirds grass and one-third browse isn't just about ideal. Throw in some spring annuals like filaree, and it's hard to beat. Of course, not

all brush is forage—creosote isn't. Another important consideration is that browse alone doesn't, as a rule, hold soil erosion in check. Grass does the trick.

Now, while this lovegrass is a tough customer and can take some hard knocks from the weather and from grazing, too, on occasion, it's just like any other living plant. It can't be kicked around. Reliable information on its proper degree of use is lacking, but it's probable that no more than 40 percent of its annual growth should be grazed off. In other words, while it's undoubtedly a wonder grass, it isn't supernatural!

To get best results in planting, ground preparation, such as ripping or discing, is necessary. A shallow, firm seed bed is desirable. Seed can then be broadcast or drilled in. Best results are had with a seed drill followed by firming the ground with a cultipacker. Very good stands have been obtained, however, by simply ripping the ground, broadcasting the seed, and then forgetting all about it.

Where the average annual rainfall is less, solid seeding can be done in flood plains. In case rainfall is below 12 inches and the planting is to be on other flood plains, it is best to plant in furrows on the contour. Furrow spacing can be anywhere from 10 feet to 50 feet, depending on soil texture and steepness of slope. If, later on, it should prove to be that there is enough moisture between the furrows to accommodate more grass, the matter will be taken care of by natural reseeding from the furrow plantings. Where the problem involves "slick" bare ground, the process can be speeded up by breaking out new furrows between the old ones.

In some places, rabbits can really make a new small planting look sick, so the surest way of getting around them is to plant enough acreage at one time so that the rabbits and even grasshoppers can have some and still leave enough to grow beyond the seedling stage and survive.

Cost of planting depends on what equipment you have or can get, and the accessibility of the area to be planted, on the kind of soil, the amount of brush and a few other factors. Under average conditions, however, it shouldn't cost more than $1.50 per acre for contour seeding, and $3.00 for solid seeding. The cost may prohibit solid seeding except in the very best sites. No claims with respect to carrying capacity are being made, because it must be appreciated that Lehmann love-grass is new in this country. On poor sites the figure will certainly be less than for good sites. In alluvial bottoms subject to natural ffooring, it would not

be surprising if 20 acres supported a cow year-long.

Unfortunately there are bottlenecks right now which are impeding a greatly expanded rate of planting. This first one is scarcity of seed. Plantings to date have been with seed raised in Soil Conservation Service nurseries. Owing to the war, commercial seed houses and farmers have not gone in for raising this relatively untried plant for seed. Seed production is not difficult, however. On good irrigated farm land, yields of from 200 to 400 pounds of seed to the acre can be expected. Seed can be harvested and cleaned readily with a small combine. If a combine is not available the crop can be cut with a binder and laid in windrows, left for a few hours and then picked up carefully with forks and thrown into a tarp-lined truck and hauled to a stationary thresher. When one considers that there are 7 million seeds to the pound it readily can be seen that a small irrigated acreage devoted to seed production would result in a tremendously greater amount of range land being planted. Because of the smallness of the seed and its high viability, it only takes about 1 pound to plant an acre of range land.

One rancher in southwestern New Mexico, who believes the grass has great possibilities, has several acres of it under irrigation. He intends to raise seed and plant it on his range land. When planted for seed production on irrigated land, the grass can be drilled in rows and cultivated, or sown broadcast. As Lehmann lovegrass is a warmweather grower, spring and summer are the best times for planting. Seed-increase plots should be established on clean land, free from Bermuda and Johnson grasses. Although considerably more production can be obtained from irrigated seed—increase plantings. Good seed crops have been produced from range planting and are often worth harvesting.

Handling Farm Help

Condensed from The Michigan Farmer

E. F. Rebman

Farm Management Section, M. S. C.

How can farm help be made more effective? What is the influence of terms of employment, cash wages, bonus plans, perquisites, hours worked per day, vacations, and living conditions on the continuity and effectiveness of farm labor? To obtain definite information on this subject, the Farm Management Section of the Michigan Agricultural Experiment Station interviewed or sent a questionnaire to 103 farmers, in 21 counties of Michigan, who normally hire one or more year-around men.

Probably the best measure of successful labor management is the number of years a hired man remains on a particular farm. The average number of years for the single help on the same farm was 3.2 and for the married help it was 2.6 years. Of the single help, one man had stayed 19 years on the same farm, one 18 years, one 16 years and a fourth 12 years. Of the married help, one hand stayed 20 years, one 14 years, and 2 more 11 years on the same farm. Some 24% of the help had worked less than one year on the same farm, while 16% had stayed over 5 years.

Single men averaged 26 years and married men 33 years of age. Some 16% of the help were 20 years of age or less while 10% were over 50 years. The men who stayed the longest, in most cases, were older than the average age shown for all men in this study. The married men on the same farm this year as last averaged 36 years of age as compared to 29 years for those employed for only a few months during these 2 years. Single help showed the same trend, 29 and 23 years respectively.

Cash wages in general for 1944 were reported to be about 6% higher than those paid during 1943. The amount of wages paid is one of the factors influencing continuity of farm labor. For example, the farmers who now have the same hired man as they had last year paid wages about 25% higher than did those who lacked help part of the time during 1943 or 1944. Also, the married men who are employed on the same farm this year as last and who received cash wages

Reprinted by permission from The Michigan Farmer, May 19, 1945

above average had stayed on the same farm about a year longer than had those who received cash wages below average.

About 45% of the hired men, who are employed on the same farm this year as last, will receive some form of bonus when this year's work is completed. The men who expected to receive this bonus had been working on the same farm about a year longer than had those who do not expect to receive any. Some farmers give a certain amount of money at the end of the year if the men have been employed the full year. Others, who have special crops, have an arrangement whereby they pay double-time during the harvest of this particular crop. There are still other farmers who have a profit-sharing arrangement with their help whereby they give them a certain percentage of farm income.

Sharing your profits with the hired men is an added incentive to make him stay longer on your farms. Some 16% of the farmers who hired married help, shared their profits with their men. Under this arrangement the help received a basic wage every month and then at the end of the year a certain percentage of the farm income as a bonus. Some farmers gave one-eighth of the net farm income. Others gave 10%. Some gave 1% of the gross income. Still others gave a basic wage for the first 6 months and then discontinued that and gave 5% of the gross income. Whatever the form may be, however, a share of the profits seems to be preferred by the hired help. There are several requirements for a satisfactory profit-sharing agreement. Confidence of each in the other's ability is important. There should be a written agreement as to what percentage of the farm income will be given to hired labor and also as to how this farm income is to be computed. Adequate farm records must be kept so that the farm income can be figured.

The single men received board, room, and laundry in addition to their cash wages. It might be of interest to place a value on these "extras" in order to see what the hired men were actually receiving. An estimated cost of boarding men on a farm might be somewhere around a dollar a day or about $30 a month. Room rent would run about $8 a month. The laundry bill probably would be about $2.50 a month. This would make a total of $40.50 being furnished single men in addition to their cash wages and would give them a total wage per month of almost $115.

The married help received such perquisites as milk, eggs, meat, fuel, light bill, house rent, and

other items in addition to their cash wages. The value of these perquisites, when averaged for all of the men, is about $33 a month. If this is added to their cash wages for this year ($102.00 a month) it would make the total amount received from their employers slightly more than $135 a month.

Some farmers are of the opinion that the value of the perquisites should be included in the pay check and then have the hired men pay for what they get. This comment is one that is worth some consideration. Too many hired men take it for granted that about everything in addition to cash wages will be furnished on a farm and think little or nothing about the actual value of the perquisites they are receiving. They compare the cash wages offered by the farmers to those being paid in the city and fail to realize that all living expenses must come out of these city wages. To make comparable figures, the rent, fuel, milk, eggs, most of the meat, and the light bills must first be deducted from the city wages when comparing them to those being paid on the farms. When this is done, the difference will not be as great as is first thought.

The average length of work day during the summer of 1944 on these farms was reported to be 11 hours. This does not include time for meals. Only 3% of the farmers worked less than 10 hours while 10% worked 13 hours or more per day. The farmers who had a work day of 11 hours and less kept their hired man on the average almost 2 years longer than did those who had a work day of more than 11 hours.

About 45% of the farm help in this study had arrangements with their employers for a vacation. These vacations were usually for a week or 2 with pay. The farmers who gave their hired men vacations had these men about a year longer than did those who gave no vacations.

A clean, comfortable tenant house is necessary for married men. About every tenant house in this study had electricity. Three-fourths of them had running water. One-half of the tenant houses had a bathroom. Thus it seems as though the housing situation for farm help is not too bad.

The personal relationship between the farmer and his hired man has an important bearing on the continuity of farm help. Both parties must have the desire and the ability to get along with each other. There will be times when one will do something that will somehow or other bother the other person. Small items of this nature lead to dissatisfaction between the farmer

and his hired man and may end with no help. The important thing that both employer and employee must realize is that the other person is a human being and that he might be right while you could be wrong.

In summary it may be stated that the farmers who had help the longest had older men, paid cash wages higher than average, gave a bonus to their help, had a shorter work day, and gave their men vacations.

Soil Fertility Lost in Burning Over Forests

Condensed from West Plains Journal

Dr. William A. Albrecht

Chairman, Department of Soils, University of Missouri

WHEN we burn over the forests we are prone to forget that harm is being done to one of our big crops by destroying the soil fertility. This destruction is more serious than is burning corn stalks, straws, and similar farm crop residues. It is a destruction of the ROTATING SOIL FERTILITY or the trees' mineral nourishment, when we burn the forest litter, or humus that represents the tree's provision for its own old age security.

Forests have, seemingly, always been an enemy of man. This would be the conclusion when we see almost everywhere that we are cutting down the forests, clearing the land, plowing the soil, and fanning the microbial fires to burn out hastily for purposes of our own food production, the humus supply that the trees were maintaining so parsimoniously for their own nourishment and survival.

Should Look on Trees as a Crop

We are seldom ready to consider trees as a crop in the same way as the corn plants, wheat plants, grasses, and other plants. For this latter group of crops we choose the soils suited for each of them. We eliminate the weeds as competitor crops. In fact, we give the plants all the advantages of the best in the way of soil fertility by building up humus through green manures for them. Isn't it about time that we think of our forest trees as a crop? Shouldn't we manage the soil and this wood crop for most effective tree growth and maximum yield of tree products just as we are managing any other

Reprinted from West Plains Journal, Missouri

crop on the land for their maximum products and the minimum of soil destruction?

The burning of the woods in the spring—or at any season—is a serious reflection on our wisdom in forest management. It is a much more serious reflection on the wisdom of better soil management under trees. In fact it suggests that we have not given much thought to either the tree crop or the soil fertility when we set the dry forest litter on fire.

When the woods are burned over, naturally many of the trees are injured at the base. Scorching the lower side of a tree or burning a ring around the bottom of it are a degree of girdling by which trees are commonly deadened. Young seedling trees are killed, so burning is not only poor forest management because it destroys the present tree crop, but also because it destroys the oncoming crop that would normally follow the present one and thereby maintain the forest. Fires in the woods to destroy the accumulated leaves and litter are poor forest management.

Burning the forest is even a much poorer practice if one considers it in terms of soil management. In fact it is forest destruction from the ground up. It destroys the trees by starving them. But how can this be, you may well ask. Have you ever reminded yourself that trees must take out of the soil about a dozen chemical elements for their growth. These dozen elements make it possible for the tree to use the air and water, through sunshine power to construct the annual crop of leaves and to build the annual rings of wood that represent the enlargement of the tree trunk and are the yearly production of wood or lumber. The roots of the trees must go deeper and deeper into the soil, and spread out wider and wider in their annual growth to find these chemical essentials for maintaining the living tree. Unless the tree is getting these necessities, or is being fed by the soil fertility, it must die.

When the forests are unburned, unpastured, and free from other disturbances, there is an annual drop of leaves to build up the litter as a forest floor covering. This is an excellent absorber for water, to prevent its runoff, even on very steep slopes. The canopy of the trees breaks the rainfall, which seldom is heavier than the absorbing blanket of leaves on the forest floor will take and hold and thereby prevent serious erosion.

Trees are Nature's protector for steep slopes. They not only put a thick blanket of leaf cover on top of the soil to hold the rainfall while it drips through slowly to soak into the soil for more effective watering of the

tree crop, but the trees also are holding themselves up into the air like a perforated umbrella so that the water cannot come too rapidly for the blanket on the forest floor to take and to pass downward into the soil for the use of the trees. Erosion is thus reduced and Nature has put these erosion-preventing forests where erosion is severe when the litter is removed as burning does.

Burning the litter on the floor of the forest not only encourages rapid runoff of water and thereby reduces the chances for the trees to drink their necessary rainfall, but it also reduces their chance to get and eat their soil foods. When the fertility, or chemical elements from the soil go up into the trees they move to the leaves. There they serve in the catching of sunshine to make the woody materials, and to fabricate the "growing" substances or chemical complexes, that keep alive the cambium layer and the winter buds at the end of every twig, so they can renew the leaves again the next season. Each leaf is a manufacturing laboratory. It has in it much of the soil fertility that served to get the water and air combined in wood-making. Much of this fertility did not enter into the compounds they helped manufacture. As a collection of different chemical elements that came from the soil and did their service of making wood and new growing tissue, they are passed back to the soil when the leaves drop annually to decay slowly. The forest trees are able to grow on what seems rather infertile soil, because they keep putting back into the soil most of the fertility they take out. They survive during many years to become the patriarchs only when this annual security payment of their own is left undisturbed to accumulate to good depths in all stages of decay and is not disturbed by fire.

Burning the forests converts the fertility in the leaves from organic, and therefore slowly soluble compounds, into the oxidized, quickly soluble forms. With the first dash of rain the ashes from the forest fires are quickly swept away as an alkaline solution. They carry away from the soil additional fertility when in water they form this lye solution that dissolves from the burned-over soil what water alone would not. The ashes that are rich in the element potassium, or potash, move away this one element that is used in large amounts in growing forests. Because this lye solution collects rapidly or drains into the back waters where fish would spawn, the wildlife in the waters of the burned-over forests is also endangered. Burning, with its damage to old trees, young trees, the soil and even the fish in the

streams, is thus more far-reaching in its destruction than one would believe. Burned-over soils, when finally cleared, are little more than a desolate country.

The soil has long been paying the bill for our indifference to its wise management. Forest as well as field soils come under our ruthless destruction of the humus or organic matter. This has come about through flaming fires set by matches above the soil surface in the uncultivated forests, and through excessive cultivation with its microbial respiration for humus destruction within this important soil layer of our cultivated fields. Surely soil conservation must come to the forests, too, as it is coming to the fields, and we are not going to continue to rob the trees of their old age security by continued firing of the woods.

Pasture Fertilization

Condensed from The Shorthorn World

Dr. H. W. Bennett

Few farmers would attempt to grow many crops, year after year, without the use of some fertilizer. The pastures respond to fertilization just as any other crop—and that cattle respond to fertilized pastures—has been shown repeatedly by many pasture experiments. Such tests have shown that fertilization produces material of a higher quality that is eaten in preference to material produced on unfertilized areas.

Pastures are nothing more or less than grasses and legumes, and like any other crop the yields obtained are in proportion to the treatment given. Experiments have shown that the amounts and grades of fertilizer used on many crops will pay on pastures but that it is more practicable to apply only the mineral elements, primarily phosphates, to pastures and allow the legumes to gather the nitrogen.

This is shown by the results obtained from top-dressing with varying fertilizer analyses pastures seeded to recommended seeding mixtures. Data from 4-year tests with fertilizer of different analyses applied at 400 lbs. to the acre with and without 1000 lbs. of dolomitic limestone on Grenada soil in Mississippi show that phosphorus was the most efficient and the most profitable element used in the test, whether

Reprinted by permission from The Shorthorn World, Aurora, Ill., May 10, 1945

it was applied alone or in combination with other elements. More herbage was produced with phosphorus alone, and at considerably lower cost. No other treatment produced as much increase or as economical increase as the equivalent to 240 pounds of 20-percent superphosphate per acre. Other tests have shown that potash should be applied only on soils of a known deficiency—where other grasses and legumes respond to applications of potash.

Yearly applications of phosphate give yearly increases in plant production. These yearly increases are due to not only a stimulated growth of legumes (hop, and Dutch clovers and lespedeza) but also to an increase in the population of these legumes. The effect of a single 400-pound (20-percent) application of phosphate increased yields during four crop years and was still slightly increasing the yield the fifth year after application. Annual applications were still almost doubling (91-percent) the yield in the fifth year, and this increased yield amounted to 2,635 pounds of high-grade hay that year.

Yields, or increases in yields, do not tell the full story of the value of fertilizing pastures. The percentage of legumes at the beginning of the test was 15 percent. At the end of the fifth year the percentage of legumes on the check plots was still 15 percent, but on the plots receiving one application of superphosphate the percentage of legumes was 45 percent. The plots receiving an annual application of 400 pounds of 20-percent superphosphate contained a plant population of which 80 percent was legumes. Thus, the increase in the yield was not just plant material, but was made up mainly of legumes. The value of such a product may be judged by the present prices for legume hay.

Cattle grazed these plots in the preference order of: phosphate annually, one application, and no phosphate. A chemical analysis was made of the material produced. Records of the seasonal composition of the herbage produced, show where phosphate was used there resulted an increase in the elements determined. This was true 5 years after one application, but was especially noticeable after annual applications. This increase in food value coupled with the increase in legume growth, resulted in more grazing of the herbage produced on the phosphated areas.

Such data show that pastures respond to fertilizers just as other crops. If properly fertilized, and followed with good grazing and management practices, pastures can become one of the more important and profitable crops on the farm.

New Mexico Sheep and a Professor

Condensed from The Western Farm Life

C. E. Hellbusch

THIS is the story of New Mexico sheep growers and a man who is helping them on the road to greater production and profits. The man is P. H. Neale, associate professor of animal husbandry at New Mexico A. & M. College.

The opportunity came in 1938, when John Knox, of Texas A. & M., was hired to head the animal husbandry department at New Mexico. Knox believed the faculty members should be the best in their respective fields and they should make a contribution to the agriculture and the livestock industry of the state. This was what Neale needed; he took the reins and went through the open gate. His work was to be with sheepmen, and he started immediately to help them with their problems.

New Mexico sheep were known to produce short and heavy shrinking wool. Neale started an experiment at Wagon Mound, New Mexico, with the John Hinde flock to determine the best type of sheep for the New Mexico ranges. There are about 1,600,000 breeding ewes on the state's ranges and Neale hoped to improve the wool clip and the lamb weights from the determination of the best type for the area.

His first experiment proved that a big, long-wooled, open-faced ewe will produce more wool and lamb than any other kind. That meant rams of this kind would have to be found and the two mated together to produce the kind of sheep wanted. The next problem was to get the results to the sheepmen and have them start on a program of this kind. The New Mexico Wool Growers Association is a modern, progressive organization and the officials immediately saw the value in the work. They urged all members to cooperate and it wasn't long before the ball was rolling.

The only way to get the information across to the breeders was to get out into the flocks. Neale took to the field and showed the breeders how to apply the principles of genetics on a mass basis by selective matings.

At shearing time the ewes were divided into three groups—the longest wooled, the medium-wooled and the shortest wooled. This was done by opening the

Reprinted by permission from The Western Farm Life, Denver, Colorado, May 15, 1946

wool of each sheep just back of the hip and estimating the length. The longest-wooled were chalk marked on the head, the medium ones on the back and the shortest ones on the hip. Each group was then separated and sheared separately. The headmarked ewes when sheared were required to yield a minimum fleece weight. If any head-marked ewe didn't shear above 8½ pounds she didn't retain the head mark.

When shearing was completed all the long-wooled, heaviest-shearing ewes were identified and painted with a separate brand. The rams were handled and marked the same way. Then at breeding time the best ewes and the best rams were mated together. With this plan the sheepmen who are cooperating are making wonderful strides in improving their flocks.

This system, in the 5 years it has been going on, has added from 5 to 8 pounds on the average lamb weights each fall and about 80 cents to $1.00 a head increase in income from each ewe for wool. This means something to a big flock owner. The experiment station has found that when the wool length is increased from one-fourth to one-third inches 1 pound is added in weight. It isn't hard to figure what this means when short wool is bringing $1.12 a pound on a scoured basis and long wool brings $1.20.

When Neale and Ivan go into the field to work with flock owners they have difficulty getting home. One man tells another and every one wants them to check their flocks. They examined 60,000 sheep in March, and before the shearing is over this spring they will probably have worked on close to 150,000 head. The producers are rapidly seeing the value of this selective mating.

Neale has wool samples all over his laboratory — samples from all sections of the state— from commercial flocks and from purebred flocks. It doesn't take long to discover one important point in this work, namely, the commercial sheepmen who have been following this selective mating program are producing longer and better wool than the majority of purebred breeders. This means the commercial men will have to breed their own rams until the purebred men catch up and get the kind of sires they can sell to the commercial producers.

In choosing the long-wooled, big ewes to carry on this program, there must be rams of this type. That may change the idea of some sheepmen on the type of sire they should choose. Neale has found in his work that a big, shaggy-looking ram as a yearling is the kind that produces the best results. Such rams look rather loose and open fleeced, but after

their first shearing they have much closer fitting wool and wool that is longer and shears heavier.

Officials of the New Mexico ram sale are recognizing the fact that the purebred breeder will have to get on the band wagon, so they are embarking on a new program for their sale to be held in August at Albuquerque. They are sampling the wool from every ram consigned to the sale, when the consignors will consent. A lock of wool is taken from the hip of the ram when he is a yearling and a number is tattooed in the ear so he can be permanently identified. Then the length of the wool will be printed in the sale catalog with the consignment. The buyer will know just what he is getting in wool length and can quickly tell whether he can use the consignment. Sale officials are getting excellent co-operation from the consignors and will have wool lengths in the catalog for about 80 per cent of the rams to be sold.

There is another advantage to this selective mating program. It is possible—and many are doing it—for growers to sack the wool from the various wool length groups separately at shearing time. This wool can be sold practically as graded and the buyers know just what they are getting. The sheep men are able to realize a higher price from their wool in this manner.

Neale has also made another valuable contribution to the industry. He has worked out a simple way in which the grower can estimate the shrinkage of his wool. The method is based on first determining the actual shrinkage of a wool clip by visual-dirt groups. This is done by dividing the wool clip samples into piles according to the amount of visual dirt. These batches are then cleaned separately. This gives a definite shrinkage figure for each different visual dirt group. Unscored grease samples from each dirt group are also kept. They are used as models for future comparative groupings. The rancher can take samples of wool from every fifth fleece in his flock and divide them into dirt groups, using his models. He can then determine quite closely what his clip will shrink. When he sells his wool he will have his own estimate and he will come nearer getting what his wool is worth.

New Organic Fungicides

Condensed from Pacific Rural Press

George A. Zentmyer

Plant Pathologist, University Citrus Experiment Station

IN RECENT YEARS many synthetic organic chemicals have come into prominence in several fields of science, including agriculture. Thousands of organic compounds have been tested in fungicide laboratories during the past five or six years, and as a result, several effective new fungicides have appeared on the market. Other compounds which are even more promising than these are in the development stage at present.

Copper and sulfur, standbys in the control of plant diseases for over 40 years, thus seem well on the way to losing their supremacy. Many of the organic chemicals have the advantage of higher toxicity to fungi, lower toxicity to the host plant, or both. Some tend to be more specific than copper or sulfur, and may be more easily inactivated, but where properly used for certain diseases, these new fungicides are extremely effective. Research is continually developing new possibilities, and there is an increasing tendency to "tailor" fungicides for specific purposes by slight alterations in the chemical structure.

Some of the new organic fungicides, which have either already replaced copper or sulfur, or will undoubtedly soon do so, for many uses, include:

Spergon (tetrachloroparabenzoquinone.) Developed at the Connecticut Experiment Station in co-operation with a rubber company in 1940, has already found an important place in seed treatment for control of damping-off and root rot. It is particularly effective on peas and beans.

Fermate—(ferric dimethyl dithio-carbamate.) Effective as a spray for controlling apple scab, peach leaf curl, brown rot of sweet cherries, Phomopsis blight on eggplant, early blight and anthracnose of tomato, and tobacco blue mold. It is usually used at 1 lb. in 100 gallons of water.

Thiosan and Trasan (tetramethyl thiuramdisulfide.) Manufactured in the wettable (Thiosan) and non-wettable (Arasan) forms. The wettable form has

Reprinted by permission from Pacific Rural Press, San Francisco, Calif., May 12, 1945

given good control of various turf diseases, while the non-wettable type is an effective seed treatment.

Elgetol (sodium dinitro-ortho-cresylate.) This compound has found some use primarily as an eradicant—in control of black rot of grapes, cedar-apple rust on cedar, apple scab, and asparagus rust.

Organic Mercury Compounds —Several have been used primarily as seed treatments. Among them: Semesan. (3% hydroxymercurichlorophenol), Ceresan (2% ethyl mercury chloride), Semesan Bel (12% hydroxymercurinitropherol and 2% hydroxymercurichlorophenol.)

Dithane (disodium ethylene bisdithiocarbamate.) One of the most promising of the newer compounds. It has been extremely effective this past season against early blight of potato, and has shown promise in control of apple scab and rust, black spot of roses and cherry leaf spot. Dithane also has some insecticidal value. The effectiveness is increased by using 1 lb. of ZnSO4 and one-half lb. of hydrated lime with 1 lb. Dithane in 100 gallons water.

Zinc dimethyl dithiocarbamate —This relative of fermate was used on large experimental scale for the first time in 1944, and produced exceedingly promising results. It gave very good control, as a spray, of early blight and anthracnose of tomato, early blight of potato and celery, and was effective against potato leafhoppers. One manufacturer has a wettable form, which as yet has not been given a trade name, while another produces the chemical under the name of Methasan.

Puratized (liquid organic mercury compounds.) A manufacturer is producing a series of these fungicides, in co-operation with the Rhode Island Experiment Station. One of them, Puratized N5D (phenyl mercuritriethanol ammonium lactate) has given phenomenal results at unheard of dilutions of 1 part in 20,000 or 30,000 (less than ¼ pint of 22% active solution in 100 gallons of water.) It has given excellent control of apple scab, bitter rot of apples, and turf diseases in the limited experimental work done to date. At present this fungicide is available only for experimental work.

Isothan Q 15 (lauryl isoquinolinium bromide.) This is another liquid fungicide with detergent properties, and has given good results during the past season in control of apple scab, turf diseases, and brown rot of cherries, used at a dilution of 1-5000.

Compound 604 (dichloronaphthoquinone.) This compound has been very effective against many fungi, but has shown occasional toxicity to the host plant, and

hence is not yet available commercially. It has given good results as a seed treatment for peas, as a spray for Septoria leaf spot of tomato, and in treating twine in hop downy mildew control, to mention a few uses.

A number of the above compounds, including Dithane, Puratized N5D, Spergon, Isothan Q 15, U. S. R. 604, and Zinc dimethyl dithiocarbamate, are being tested at the Citrus Experiment Station for control of several diseases of citrus and of other plants.

Protein for Pigs on Pasture

Condensed from American Feed Trade

W. L. Robison

Ohio Agricultural Experiment Station

SEVERAL factors influence the amount of protein in the concentrate portion of the ration needed by pigs on pasture. Among these are (1) the age or size of the pigs, (2) the quality and quantity of the pasture, (3) whether full or limited feeding is practiced, and (4) the relative prices of protein and carbonaceous concentrates. Another factor is the purpose for which the pigs are being developed. A protein level satisfactory for pigs for slaughter would often be less than the optimum for animals intended for breeding.

Young pigs require more protein than older ones. In an Ohio dry lot trial a few years ago, rations containing 9, 17, 26, 34, and 51% of protein were fed to pigs having an average initial weight of approximately 40 pounds. A sixth group was fed a ration containing 15.4% of protein before, and one containing 13.7% after it averaged 150 lb. in weight. The 9% ration contained no high-protein feed. When they were under 90 lb. in weight, the pigs fed as much as 26% of protein made the most rapid gains and the greatest gains per unit of feed consumed. As the protein content of the ration was increased, its laxative effect became more pronounced. Usually, because of the relatively high price of high-protein feeds, the use of a ration containing somewhat less than the optimum amount of protein, so far as performance is concerned, is the most economical.

From 90 to 135 lb. in weight,

Reprinted by permission from American Feed Trade, April-May, 1945

the pigs having 17% of protein required the least amount of feed per unit of gain, and gained practically as rapidly as those having a ration containing 26% of protein. For pigs weighing more than 135 lbs., the ration containing approximately 14% of protein produced rapid and efficient gains.

Dry lot rations containing 18 to 21% of protein for suckling and weanling pigs, or those under 60 lb. in weight, 15.5 to 16.5% for those between 60 and 125 lb., and 14.5 to 15.5% for pigs over 125 lb. in weight are suggested.

If it is of good quality, pasture reduces the amount of high-protein feed that is needed in the ration. To be of good quality, a pasture must be of a quality that pigs like. It must be ample in quantity and succulent rather than woody in character. Some pasture crops are higher in protein than others. What is probably of greater significance is that practically all pasture crops vary in their protein content at different stages of their development. As they mature, they become increasingly more woody and their protein content decreases.

Legume pastures are commonly regarded as being higher in protein than non-leguminous pastures. This depends largely on the stage of growth. During the early stages of their development, the protein content, on a moisture-free basis, of such crops as bluegrass, rye, wheat, and oats, compares favorably with that of alfalfa, clover, or soybean pasture.

On a moisture-free basis, Hunt found that alfalfa cut May 31, June 10, and June 21 contained 22, 19, and 17% of protein, respectively. Red clover cut June 10 and June 21 contained 17 and 13% of protein, respectively. At the Kentucky Station, it was found that the dry matter in growing wheat cut when 5 and when 24 in. high, contained 27 and 11% of protein, respectively.

In Ohio, McClure carried on investigations with three series of bluegrass plots which were cut 12, 8, and 2 times during the season. On April 5 the grass from the plots to be cut 12 and 8 times contained 23% of protein. On May 8, when the first plot was clipped the fourth time and the second plot for the second time, samples from them averaged 20 and 16% of protein, respectively. On June 18, when the first plot was clipped for the sixth time and the third plot for the first time, the grass from them contained 18.6 and 9.0% of protein, respectively. Ohio analyses of rye 12 in. high, of soybean pasture 10 in. high, and of Dwarf Essex rape 10 in. high showed these crops to contain 24.5, 17.5 and 20.5% of protein, respectively, on a moisture-free basis. Although grass and the cereal crops are

high in protein before they head, after they head, they are low in protein and do not appreciably reduce the need for protein in the concentrate portion of the ration.

A number of experiments comparing a ration of corn with one of corn and a protein supplement for self or full fed pigs on clover or rape pasture, were reported in Bulletin 552 of the Ohio Agricultural Experiment Station. In six tests, in which the pigs were carried from approximately 45 to 175 lb. in weight, those having an average of 8.7% of tankage in their ration, or 0.4 lb. daily per head, gained ¼ lb. more, daily per head, and required 12.7% less feed per unit of gain than those without a high-protein feed. Besides producing faster gains, each pound of tankage fed saved 2.7 lb. of corn.

In eight trials in which the pigs were carried from 66 to 200 lb. in weight, those having an average of 5.4% of tankage in their ration, or 0.3 lb. daily per head, required 7.0% less feed per unit of gain—gained more rapidly—and were ready for market 16 days earlier than those having no high-protein feed. Each pound of tankage fed these pigs, which were older and heavier at the start, saved 2.4 lb. of corn, which was less than that saved in the case of the younger pigs.

If the pasture is good, the proportion of it to grain consumed influences the amount of high-protein feed it is advisable to include in the ration. Limiting the grain results in slower gains, but keeps the pigs hungry, causes them to eat more pasture or forage and thus increases the proportion of pasture or forage to grain or concentrates consumed.

In four trials in which the pigs averaged 50 lb. in weight at the start and in which the feed was limited to 3 lb. daily for each 100 lb. of their live weight, those fed tankage with their corn, at the rate of ¼ lb. daily per head, or 6.9% of the ration, gained more rapidly. The pigs were ready for market 20 days earlier, and required 98.1% as much feed per unit of gain as those fed corn but no supplement. Each pound of tankage fed saved only 1.3 lb. of corn. Under these conditions, it did not pay to include a high-protein feed in the ration. Inasmuch as limited fed pigs are ordinarily not ready for market until later, when the price is lower, full feeding rather than limited feeding is usually advisable.

The proportion of pasture to grain consumed is influenced not only by whether a liberal or a limited allowance of grain is fed, but also by the quality of the pasture and by the quantity of high-protein feed supplied. If the

pasture is not good, the pigs will not eat much of it. If the pasture is good and the ration is low in protein, the pigs make an effort to correct the deficiency by consuming larger amounts of pasture.

In an Ohio pasture trial, groups of pigs fed rations containing 5 and 10% of tankage each, required 380 lbs. of feed per 100 lb. of gain produced. In another, self fed pigs that took 1 lb. of tankage to 10.4 lbs. of corn, required 346 lbs. of feed per 100 lbs. of gain; whereas comparable pigs that were fed twice daily and given a pound of tankage to 19 lbs. of corn, required 342 lbs. of feed per 100 lbs. of gain. In both instances, the pigs having the smaller amounts of supplement ate more pasture than the others.

Last year, Vestal of the Indiana Experiment Station, tried limiting the supplement of pigs which had ample quantities of good alfalfa pasture. All of the lots received corn and minerals. One was given no supplement. Five were given a 35% supplement for a part or all of the time. The corn, minerals and supplement were self-fed, separately. Lots 2, 3, 4, and 5 had no supplement after they averaged 100, 125, 150, and 175 lbs. in weight, respectively. The supplement for Lot 6 was continued until they reached the final weight of 200 pounds.

a weight of 100 lbs. did not reduce the feed required or the cost per unit of gain. The rapidity of the gains, however, was in alignment with the length of time the supplement was fed. This indicates, that to counteract the drop in the protein content of the ration, after the supplement was discontinued the pigs ate a larger proportion of pasture to concentrates. Pigs which averaged 75 lbs. in weight at the start were used in the experiment.

In a 1944 Ohio test, on rape pasture, one group of self-fed pigs was given a ration containing what was regarded as a full allowance of protein, or 14.6 and 12.0%, before and after they averaged 120 lb. in weight, respectively. Corn and minerals were fed. The protein supplement was a mixture of one part tankage and two parts soybean oil meal. A second group was given a full allowance of protein during the growing period, but a reduced allowance during the fattening period. A third was given a reduced amount of protein during both periods. A fourth was given a full allowance during the growing period but no high-protein feed during the fattening period. Although distributed differently, the total amount of protein supplement given them was approximately the same as that given the third group. A fifth group was given a reduced

In his experience, feeding a supplement after the pigs reached amount of protein supplement during the growing period and no protein supplement during the fattening period. The pigs were carried from approximately 48 to 215 lbs. in weight.

The groups as named made average gains of 1.52, 1.48, 1.39, 1.35, and 1.22 lbs. daily a head and required 374, 384, 418, 386, and 413 lbs. of feed per 100 lbs. of gain. With corn at $1.12 per bu., and tankage and soybean oil meal at $80 and at $60 per ton, the cost of the feed and pasture per 100 lbs. of gain for the five lots was $9.11, $9.23, $9.88, $9.17 and $9.69, respectively.

The group which had an ample allowance of protein supplement during both the growing and fattening periods made the most rapid and economical gains. When the protein supplement was limited, although the total quantities in the two instances were approximately the same, feeding a liberal amount while the pigs were young and no supplement later was preferable to feeding a reduced amount for the entire time. These findings agreed with those of a similar test the preceding year. In both trials, too, the pigs on the lower protein rations ate larger amounts of pasture, gained more slowly and were fatter or less growthy at a given final weight than were those fed more protein.

The amount of protein needed by pigs on pasture that is closely grazed or poor in quality, is not greatly different from that needed by pigs in dry lot. Proportionately, the amount needed by full fed pigs is greater than that needed by limited fed pigs and the amount needed by young pigs is greater than that needed by older pigs. Because of the influence of a number of factors, no specific amount which will be the most satisfactory for all conditions can be given. For feeding with corn and minerals to full fed pigs which are carried from 50 to 225 lbs. in weight on good pasture, however, an amount of supplement which will supply 0.27 lb. of protein daily per head will not be far wrong.

Lambs Put O. K. on Silage

Condensed from Farm Science Reporter

C. C. Culbertson and Fred E. Ferguson

IN LAMB feeding trials here at Iowa Station during the past winter, we had two main objectives in mind: (1) To find whether it would pay to feed lambs corn silage and alfalfa hay instead of hay and (2) whether one can and should push lambs up to a good feed of shelled corn and hold them at that level, or whether the amount of corn should be shifted from time to time in accordance with the appetite of the lambs to keep them on full feed.

The feeding tests of 100 days, gave these results:

1. The best margin over feed cost was obtained from the two lots of lambs which were given a full feed of corn silage in the morning and alfalfa hay at night, together with a full feed of shelled corn, 0.2 pound of soybean oil-meal per lamb daily, a simple mineral mixture and salt self-fed.

2. It paid this past winter to full-feed shelled corn rather than to limit the corn and hold the lambs at that level.

3. It was highly profitable to feed silage. The silage was charged to the lambs at $8 a ton, but it displaced enough other feed so that its actual feeding value was about $14 a ton.

4. All six lots of lambs showed a good margin over feed cost. This ranged from $1.95 to $3.55 per lamb for the 100-day feeding period.

White-faced Montana lambs were used. They weighed an average of 74 pounds each when the feeding started December 12. The lambs were divided into 6 lots of 50 lambs each. These were fed for 100 days, and at the end of the feeding period were sold and slaughtered.

The lambs cost an average of $13.57 per hundred in the feedlots at Ames. This included the freight, cost of feeding the lambs and handling from the date purchased up to the time the feeding began.

These lambs proved to be rather light corn eaters, inasmuch as the daily consumption of corn never exceeded 1.75 pounds. The two lots which were full-fed on corn and hay ate an average of 2.37 bushels each per lamb during the 100-day feeding period.

The silage used in these tests had approximately 15 percent of corn in it.

Reprinted from Farm Science Reporter, Ames, Iowa, April, 1945

In this feeding experiment there were three series of two lots each. Lots 1 and 2 were fed corn silage in the morning—all they would eat after they had been given as much shelled corn as they would clean up in about 20 minutes. On top of the silage they were given 0.2 pound of soybean oilmeal per lamb daily. Then they were given a full feed of shelled corn again in the evening and what alfalfa hay they would eat. They also had a simple mixture made up of 70 pounds finely ground limestone and 30 pounds special bone meal. This was fed over the silage at the rate of ¼ ounce daily per lamb. Block salt was kept before them all of the time.

On this ration, Lots 1 and 2 showed the largest margin over feed cost of any of the lots. They averaged $3.39 and $3.55 per lamb when sold. They were well finished and when the carcasses were graded after they had been slaughtered, each of the lots had 47 grade AA carcasses and 3 grade A. These two lots were very close in all respects—amount of gain, feed consumption, selling price and margin. They were appraised on foot at a difference of 10 cents a hundred; feed cost for 100 pounds of gain differed another 16 cents. It so happened that the lots appraised at the higher price also made their gains at the lowest cost.

Lots 3 and 4 were fed the same as Lots 1 and 2 except that they got no corn silage, but instead were fed hay twice a day, only half as much soybean oilmeal and none of the mineral mixture.

The returns from these lots over feed cost were next best to the lots on corn silage. The margins over feed cost for the two lots were $2.48 and $3.24 per lamb. The cost of feed for 100 pounds of gain differed only 17 cents, but the selling price was 60 cents higher for Lot 4 than for 3. When the lambs were slaughtered the carcass grades of the two lots were exactly the same—each had 46 lambs with AA grade and 4 with grade A.

In our Lots 5 and 6, fed the same as Lots 3 and 4 except for shelled corn, we were trying to see whether or not it would be good procedure to get the lambs onto a good feed of corn—about what might be near full feed—and then hold them steadily at that same feed. We found, however, when we got the lambs up to 1½ pounds a day per lamb and tried to hold them there that the light eaters held back and were not cleaning up the corn. Then the heavier eaters gorged themselves on corn, and as a result we lost two lambs.

We then dropped these lots back to 1¼ pounds a day and held them at that rate to the end of the feeding period. We were

able to keep them on feed at that level, but these lots did not gain quite as fast as the silage lots and the other two lots on hay and a full feed of corn.

These two lots ate more hay than the others, but less corn. The cost of feed for 100 pounds of gain was slightly the highest and the margin over feed cost the lowest. The grade of the carcasses of lambs from these lots was not quite as good as the other four lots.

The price of feed used for these lots of lambs was figured as follows: Shelled corn (14 percent moisture) $1 per bushel; silage $8 per ton; alfalfa hay $20 per ton; minerals $25 per ton, and salt $20 per ton.

On the whole, the feeding of lambs during the past year showed a fairly good margin over feed cost. These tests indicate that either the use of silage or alfalfa hay with a full feed of shelled corn will produce satisfactory gains and margin over feed cost with the prices of feed and of lambs the past winter.

Effect of Age on the Weight and Production of Range Cows

Condensed from The Cattleman

J. H. Knox and Marvin Koger

New Mexico Agricultural Experiment Station

COMPLETE records on weights of cows and calves have been kept for a number of years on the experimental range of the New Mexico Agricultural Experiment Station. Some data are presented here which it is thought will be of interest to ranchers and cattlemen in general.

The range on which this study was conducted is a semi-desert grassland type located about 20 miles northeast of Las Cruces, New Mexico. The average annual rainfall is less than 9 inches. The principal grasses are black grama and mesa dropseed with minor but appreciable amounts of tobosa and three-awn or needle grass. Browse is of little importance in the pastures where these records were taken. The range has been conservatively stocked since the period of severe drouth ending about 10 years

Reprinted by permission from The Cattleman, June, 1945

ago. The years covered in this report were 1939 to 1944 inclusive. With the exception of 1943 these were years of average or better-than-average forage production. Cattle on the range were fed bone meal mixed with salt to correct a deficiency in phosphorus. Little other supplemental feeding was done. A small amount of cottonseed cake was fed to calves at time of weaning and to the 3-year-old heifers while they were calving the first time. Cows were bred from June to September and calves were dropped in March, April, and May and weaned in October or early November. The average age at weaning was about 205 days. Ten-year-old cows were shipped when their calves were weaned. The calf crop has been about 91 per cent based on the number of calves weaned, or 95 per cent based on the number of calves born. The practice has been to sell each year all cows that failed to calve.

Table 1—The Weight of Cows at Different Ages and the Weight of the Calves Produced

Age of Cows	Avg. Weight of Cows	Avg. Weaning Wgt. of Calves
3	908	387
4	952	405
5	933	429
6	1,013	447
7	1,024	454
8	1,017	450
9	993	436
10	981	422

Table 1 shows the average weight of all cows of each age from 3 to 10 years old over a period of 5 years. The average weight of calves produced by each age group is also shown. Greatest weight and production were attained at 6 to 8 years of age. The close correlation between the weight of cow and calf is illustrated in the table. It indicates that highest production occurs when the cow is in the period of greatest physical vigor. This seems to be in line with numerous experiments conducted at this Station which have shown that inadequate nutrition of breeding stock is an important, if not the most important cause for unsatisfactory production on southwestern ranges. We have little trouble from infections that cause lower reproduction and death of young calves in many farming areas, and blizzards do not sap the strength of our cows and kill our calves. Sometimes calf crops are reduced by failure to supply sufficient bulls or by the improper distribution of bulls in the breeding pastures, but the fact remains that healthy cows in good breeding condition will usually get with calf if exposed to strong vigorous bulls.

Another point of interest arises from the fact that although the cows finally attain quite satisfactory weights, the time required to reach this weight is surprisingly

long. It seems reasonable to believe that cows should reach full weight by the fall after they are 5 years old rather than 1 or 2 years later. It seems that on this range and probably on many others beef production could be increased by a plan of management which results in quicker development of heifers and young cows.

The decline of cows past 8 years old in both weight and production has caused some thought on the part of those responsible for the management of the range. It had been believed that although it was desirable to sell cows at 9 years old on most ranges, on this range which was lightly stocked and well watered and where close supervision could be given, the best age to sell would be 10 years. A trial with a few 11-year-olds demonstrated that cows older than 10 years should not be retained under the system of management being followed.

In order to compare the results of selling cows at 8, 9, or 10 years old, three sample herds were set up on paper, using the data published here. Each herd contained as near 200 animal units (equivalent to 200 mature breeding cows) as is possible, using whole numbers. No allowance was made for bulls because it was found that the number of bulls required in each case was about the same. Each yearling was considered as 65 per cent and each 2-year-old as 80 per cent of an animal unit. By this is meant that a yearling heifer requires about

Table 2—Distribution of Cattle by Ages in 200-Unit Herd on Basis of Selling Old Cows at Three Different Ages

	Number	Grazing Units	Number	Grazing Units	Number	Grazing Units
	Age of Selling Old Cows					
Age	10 Years		9 Years		8 Years	
Yearlings	29	18.9	31	20.2	34	22.1
Two-year-olds	26	20.8	28	22.4	31	24.8
Three-year-olds	26	26.0	28	28.0	31	31.0
Four-year-olds	24	24.0	26	26.0	29	29.0
Five-year-olds	22	22.0	24	24.0	27	27.0
Six-year-olds	20	20.0	22	22.0	24	24.0
Seven-year-olds	19	19.0	21	21.0	23	23.0
Eight-year-olds	18	18.0	20	20.0	22	22.0
Nine-year-olds	17	17.0	19	19.0	—	—
Ten-year-olds	16	16.0	—	—	—	—
Total	217	201.7	219	202.6	221	202.9

65 per cent and a 2-year-old about 80 per cent as much range as a cow and calf.

For purposes of calculation, a few standard conditions were assumed. They are: (1) 10 per cent of the yearling heifers were culled to eliminate those which fail to grow out properly; (2) 5 per cent of the cows over 3 years old were culled in order to dispose of those that were unsound, barren, or poor producers; (3) allowance was made for a 2 per cent death loss among cows 3 years old or over; and (4) the calf crop was calculated as being 90 per cent. These are close to conditions existing on the experimental range except for death loss, which has been less than 2 per cent.

Table 2 shows the number of cows and heifers of each age under the three plans. Holding cows until they are 10 years old decreases the number of non-productive heifers necessary for replacement but increases the number of cows past 7 years, their age of greatest production.

Table 3

Calf Production, Based on Selling Old Cows at 8, 9 and 10 Years of Age

	Age of Selling Old Cows		
	10 Yrs.	9 Yrs.	8 Yrs.
	No.	No.	No.
Cows 3 yrs. and over	162	160	156
Calves weaned	146	144	140
Heifer calves for replacement	29	31	34
Calves to be sold ..	117	113	106

It may be seen from table 3 that the total number of cows of producing age is slightly greater when cows are sold at 10 years of age. Because of the greater number of cows, more calves are produced in the herd when cows are sold at 10 years of age. The number of calves which may be sold if further increased by retaining fewer heifers for replacement than when the cows are sold at an earlier age. This is offset by the marketing of cows at higher prices and greater weights.

The point of greatest interest is the effect of the three plans on the total weight of cattle marketed each year and on the cash income. It was a matter of some surprise to the writers to learn that the weight of cattle sold annually might have been increased if cows had been sold when they were 8 years old. The slight difference in cash income was also in favor of selling cows before they become old and shelly. There is only a small reduction in the number of steer calves marketed when cows are sold as 8-year-olds. The difference in the number of heifers marketed is greater because more must be kept for replacements. This decrease in sale of calves is offset by selling more cows at a somewhat higher price and greater weight because of their younger age.

Summary

Age of maximum weight and production for range cows was from 6 to 8 years with the peak reached at the age of 7. The close correlation between weight of calf and weight of cow suggests strongly the relationship of production to plane of nutrition. The data point to two possible changes in management practices. The first is a more rapid development of young cows, bringing them to their peak weight and production at an earlier age. The second is a plan of selling old cows at a younger age than has been done formerly. Sample herds were set up to test the effect of selling cows at 8, 9, and 10 years old. It was found that even on rather lightly-stocked and well-watered ranges, cows might be sold as early as 8 years old without reducing the amount of beef produced or the cash income; in fact, it appeared that both would be increased slightly. In terms of pounds of beef sold, the advantage of selling cows at 9 rather than 10 years old was appreciable. It seems that ranchers might have the advantage of younger herds free from old weak cows without reducing their incomes. If such a change is contemplated, the present might be a favorable time because of the need for beef and the high prices being paid for cows.

Table 4—Total Cattle Sales, Based on Selling Old Cows at Three Different Ages

AGE OF SELLING OLD COWS												
	10 Years			9 Years			8 Years					
	No.	Wgt. Pounds	Price Dollars	Return Dollars	No.	Wgt. Pounds	Price Dollars	Return Dollars	No.	Wgt. Pounds	Price Dollars	Return Dollars
Steer Calves	73	32,193*	10.75*	3,460.75	72	31,824	10.75	3,421.08	70	30,940	10.75	3,326.05
Heifer Calves	44	17,598	9.94	1,749.24	41	16,418	9.94	1,631.95	36	14,402	9.94	1,431.56
Yearling Heifers	3	1,950	8.50	165.75	3	1,950	8.50	165.75	3	1,950	8.50	165.75
Cull Cows	7	6,887	7.53	518.59	7	6,881	7.53	518.14	7	6,853	7.53	516.03
Old Cows	16	15,696	6.39	846.01	19	18,867	5.75	1,084.85	22	22,374	6.25	1,398.88
Total		74,324		6,740.34		75,940		6,821.77		76,519		6,837.77

*Ranch weights and prices have been used. It was necessary to estimate the prices for 8 and 9-year-old cows for it has not been the practice to sell cows at these ages.

Insulate for Comfort

Condensed from American Poultry Journal

W. C. Krueger

(New Jersey)

ALTHOUGH poultrymen are not agreed on the necessity for complete insulation of poultry houses in the moderate temperate zone, we find increasing agreement regarding ceiling or roof insulation. It probably sounds contradictory, but justification for overhead insulation is related to summer temperatures, whereas wall insulation is primarily a matter of winter temperature control.

Birds can stand temperatures as low as 10 degrees F. without bodily injury, but have no way of adjusting themselves in the case of excessively high temperatures. High temperatures coupled with high humidity are particularly hard on second year birds and heavier breeds. This was well illustrated two years ago when poultrymen lost thousands of birds during an unusually hot spell. Older and the fatter birds dropped out first; losses were very small in houses having ceiling insulation, heavy where ordinary sheathing with roll roofing constituted the roof surface.

A three-year experiment at the New Jersey College of Agriculture poultry plant to determine effectiveness of roof or ceiling insulation showed that black paper over roofers resulted in temperatures 8 to 10 degrees higher than with the roofing surface painted white or covered with aluminum paint. Galvanized steel roofing gave similar results in reducing under-rafter temperatures. A one-inch layer of structural insulation board used as part of the roofing surface reduced temperatures 6 to 8 degrees at the ceiling level. The maximum difference in temperatures at the floor level was little more than three degrees.

This seems a slight advantage in favor of some reflective protection against heat absorption or the use of an insulating material. It is just slight margins, however, that mean the difference between survival and loss in the case of excessive summer temperatures.

Insulation can be obtained in one of three ways. A light reflection coating may be applied over the roofing material, preventing absorption of sun energy. Struc-

Reprinted by permission from the American Poultry Journal, Chicago, Ill., June, 1945

tural insulation board or loose material placed between the rafters will give effective results. Or the house can be designed to provide a so-called attic space between ceiling joists and rafters, and this space ventilated through gable louvres and partially filled with straw, shavings or other insulation material.

Common practice in the case of shed roof houses is to apply structural insulation board on top of the rafters, rather than underneath, thus eliminating rat harboring places. Where the type of roofing used necessitates a firm and solid nailing deck, roofers are usually applied direct on the rafters and covered with a well-lapped layer of vapor resistant type of asphalted paper. The structural insulation board is then applied over this and the roofing surface next. In A-shaped or broken span roof houses, insulation can probably be applied at least cost in the form of a false ceiling extending horizontally back from the front rafter plate to the intersection with the rear rafter, then following the rafter line to the rear plate.

In the case of straw loft or when using fill insulation and a ceiling, the ceiling material is usually applied on the underside of the supporting joist and the insulation packed over. In standard straw loft type houses, the straw is often supported on poultry netting instead of a solid deck, permitting air movement through the straw to the louvred attic space above. This combines insulation with a degree of ventilation.

Poultrymen consider cross ventilation as important as ceiling insulation in protecting the birds during excessively hot and humid weather. By having screened windows in the rear wall of the house, cross ventilation is provided. Tests have shown as much as 14 degrees in temperature drop at the floor level with front and back windows open. Again, ceiling or roof insulation contributes materially in preventing heat absorption within the house and therefore makes cross ventilation that much more beneficial.

That the value of ceiling or roof treatment is largely of summer benefit is shown by comparative tests under winter conditions. Houses without wall insulation but with one inch roof insulation were only two degrees warmer than those with no insulation. It should be pointed out that complete insulation of poultry houses is desirable in the more northern climatic zone and that effective ventilation of poultry houses without danger of freezing is dependent on such insulation.

Poison Ivy and Its Eradication

Condensed from New England Homestead

E. M. Stoddard

It is safe to assume that most people are more interested in the methods of eradicating poison ivy than they are in its botanical classification, but a brief outline of the family history and distinguishing characteristics of the plant seem appropriate.

Poison ivy is a common wild plant growing over most of North America south of Nova Scotia. It belongs to a small family of plants represented in the Northeastern United States by seven species, two of which are poisonous, Rhus venenata DC., poison sumac, and Rhus Toxicodendron L., poison ivy. Poison sumac is also known as poison dogwood and poison elder. These latter names are misleading as poison sumac is in no way related to either dogwood or elder and no species of these latter is poisonous. Poison ivy is also called poison oak, an equally misleading term, but no doubt having its origin in the fact that in one of its various leaf types the single leaflets of poison ivy somewhat resemble oak leaves. This leaf type is listed as a variety of species by some authorities. The names Mercury and three-leaved ivy are often used as common names for poison ivy.

Poison sumac is the more poisonous of the two plants, but it grows only in swampy places and is not of so much immediate concern to all of us as is its omnipresent and unnecessarily plentiful cousin, poison ivy.

Poison ivy grows on all types of soil, wet or dry, fertile or poor, under all conditions of light and shade, and in successful competition with all and sundry other plants. It may grow as a trailing vine in grassland, climb on fence posts, stonewalls, trees, and even buildings, or appear as an upright shrub without benefit of auxiliary support. But it is all the same poison ivy with a common distinguishing characteristic of shiny green leaflets in sets of three. The leaflets are pointed and the edges may be lobed, variously notched, wavy, or entire. It is with this plant that most of us are concerned.

The poisonous principle of poison ivy is urushiol, a material found in all parts of the plant including the roots. Contact with the plant, or with something that

Reprinted by permission from New England Homestead, Springfield, Mass., May 26, 1945

has been in contact with the plant, is necessary to produce injury. The possible exception to this is contact with smoke of the burning plant, although there seems to be some disagreement among authorities on this point. It is not our proper function to prescribe treatment, but we can say that prompt washing with laundry soap after contact with poison ivy will help materially in preventing injury.

Methods of Eradication

Poison ivy can be eradicated by removal of the plant and by the application of herbicides. Hard work and the danger of poisoning at once preclude the general application of the first method. The use of herbicides is by far the safest and easiest method of eradication. There are three herbicides which we know will eradicate poison ivy. "Atlacide," "Ammate" and borax.

"Atlacide" is the trade name for a preparation of sodium chlorate combined with some material to eliminate the fire hazard. It is a granular compound which is dissolved in water at the rate of one pound per gallon and sprayed on the foliage. One gallon will spray approximately 100 square feet.

"Ammate" is a commercial preparation of ammonium sulfamate and like "Atlacide" is sprayed on the foliage at a concentration of one pound per gallon of water.

The borax used is the common commercial borax and is applied dry to the soil where the poison ivy is growing at the rate of 10 pounds per square rod.

It should be remembered that all these materials will kill nearly all other plants just as effectively as they do poison ivy and care must be taken in using them around useful plants, shrubs or trees. It is safe to spray poison ivy under trees and shrubs with "Atlacide" or "Ammate," provided none of the material gets directly on such trees or shrubs. It is *not* safe to put borax on the soil around trees or shrubs.

Both "Atlacide" and "Ammate" are absorbed by the plant through the leaves and the resultant killing is accomplished by the herbicide being distributed throughout the entire plant from the leaves. This action makes it necessary to give the poison ivy a very thorough spraying, but it is not necessary to soak the soil. A better kill results if the poison ivy plant is left standing until the next spring, rather than mowing it off as soon as the leaves are dead. Borax is absorbed by the plant through the roots and it is not necessary to apply the borax to the foliage to kill the plant.

"Ammate" and "Atlacide" are more effective if used in August or very early September, although

a good kill will result if they are applied at any time the poison ivy plant is in full leaf. Our experiments and observations indicate that they are more effective if applied on a cloudy day because there is a better chance for the materials to be absorbed under these conditions than on a hot, dry day when the solution dries quickly on the leaves. The time of year or weather conditions at time of application do not seem important where borax is used, except that it be used some time during the growing season.

None of these materials is dangerous to handle nor are they considered poisons. It is suggested, however, that reasonable care be taken when using them and that they not be used where livestock can feed on the treated plants. If either "Ammate" or "Atlacide" is used in a sprayer that will later be used for spraying crop plants, it will be necessary to clean the sprayer *very carefully* with several washings of clean water to prevent injury to such plants from residue left anywhere in the sprayer. *Do not forget to do this.*

At the present time, "Ammate" and "Atlacide" may be hard to find locally, but either one or both should be obtained on order from dealers in agricultural supplies or large drug and chemical supply houses.

The following table summarizes our experience and experiments with the three herbicides.

Availability — "Atlacide" and "Ammate" sometimes scarce or not available for the duration of the war. Borax plentiful.

Cost—Borax is cheaper than the other two materials.

Ease of Application—Borax requires no special equipment for applying. Others require spray apparatus.

Forced-Air Curing of Field-Chopped Hay

Condensed from Capper's Farmer

M. N. Beeler

NEXT big development in haying involves putting together the labor savings afforded by mechanization and the quality insurance to be had by forced-air curing in the mow. Both have been proved experimentally and practically. But neither alone is the complete answer.

Farmers who seek high quality irrespective of labor costs will be satisfied with the forced-air method of curing long hay. But getting the half-wet forage out of the field, into the mow and spreading it evenly over the duct system is no bargain in labor.

Farmers who are satisfied with ordinary hay quality, will find the Wisconsin mechanization suited to their requirements for reducing costs and man labor. But in this system the hay must still remain in the field for curing and there is little to insure quality except as operations may be speeded and shattering is reduced.

F. W. Duffee, of Wisconsin, proposes to put the 2 processes together. Preliminary work on the co-ordination was done last season, and a more exhaustive test is planned for the coming summer.

R. C. Miller, Ohio State University, co-operated in a test of mow drying of partly cured field-chopped hay on the Anderson farm in Lucas county. Varying success was obtained during 2 years, due to problems which chopped hay offers in comparison with loose hay. Most of the hay cured bright and green altho moldy spots occurred. Miller thought improvement in blowing and duct equipment, a greater volume of air, elimination of trampling as the hay was put in the mow, more even distribution of chopped hay over the duct system would facilitate uniform ventilation, cooling and drying.

When Robert H. Murray, Porter county, Indiana, decided to combine the labor saving of mechanized haying with the high-quality insurance of mow curing, he consulted Miller and Purdue engineers on the type of installation and equipment required. He adopted the Ohio-type tunnel, 8 feet high and 4½ feet wide at the side of the mow, with lateral ducts 4 feet apart on center and extending in 2 sections to within 4 feet of the opposite wall. Laterals are open on the bottoms and blocked 1¼ inches from the

Reprinted by permission from Capper's Farmer, Topeka, Kansas, April, 1945

floor to permit air escape. Slatted false floor sections made of 1 by 2's spaced 1 inch apart on edgewise 2 by 4's were set between the ducts. Two rows of inch holes, 12 inches apart, were bored in the top of ducts to afford air passage into hay directly above.

R. H. Wileman, Purdue agricultural engineer, reports the first crop was cut in the afternoon, raked the following morning and allowed to cure in the windrow until moisture content was approximately 35 per cent. It was then picked up with a field chopper set to cut 1¾-inch length. The ventilating was done with a 48-inch, 6-blade propeller fan powered by a 7½-horse motor. The blower was operated 16 days continuously until hay moisture was down to 14 per cent. The 7-foot layer over the 36- by 40-foot mow settled to 6½ feet. Power cost was 98 cents a ton for 60 tons.

The second cutting, 30 tons of dry alfalfa-brome, was mowed one afternoon, raked the next morning and put up that afternoon by 6 men in 4½ hours. The hay had cured to 31 per cent moisture and made a layer 3½ feet deep on top of the first cutting. The fan was operated 7 days at a power cost of 93 cents a ton.

At no time during the curing period for either cutting was temperature of the chopped hay as high as the average daily outside temperature. Highest temperature within the hay after the fan was shut off was 84 degrees at a time when outside recordings went above 90. The carotene content of the first cutting was 84 micrograms a gram of hay at the time it was placed in the mow, 23 when curing was finished and 22.2 after 3 months storage. Comparable values for the second cutting were 104, 63.8 and 58.1.

Said Wileman in November: "This hay has good color and quality and is not dusty. Practically all leaves were saved. This with reduction of field exposure and low mow-curing temperatures are believed to be largely responsible for the high carotene."

Wright Brothers, Kankakee county, Illinois, filled their mow with field-cured, field-chopped hay in 1943, but found the dust objectionable. Last season they tried mow curing of field-chopped hay. A central duct system with 7 laterals each side was placed in a 38- by 42-foot mow. Three loads of loose hay were spread on the ducts to facilitate air escape. Their fan was the vane type, pulled by a 5-horse motor.

Three men constituted the haying crew, 1 on the cutter, 1 to haul and 1 to unload. Some of the hay was put in at 50 per cent moisture, but the blower clogged and thereafter they waited until it was down to 35. About 24 hours

of good hay weather were required for that condition.

The first cutting from 16 acres made 8 feet of hay in the mow, the second 3 to 3½ and the third 2½, or a total of about 13 feet. The first layer was blown 9 to 10 days, and the others less, according to depth, but in general the fan was operated continuously for a few days until the moisture content was reduced, and then about three fifths of the time and finally 3 or 4 hours a day. Since hay is presumed to keep at 20 per cent, they stopped the fan when theirs tested 18. First and second cuttings made excellent hay. The third musted somewhat, probably because of too great depth, not enough air pressure or because of the fan location.

Keeping Up-to-Date on Blackhead

Condensed from Turkey World

Dr. E. M. Dickinson

Oregon State College

At one time blackhead was considered by turkey growers as the most serious disease affecting turkeys. In certain sections of the country some of the older turkey growers may recall that this disease practically wiped out commercial turkey production.

The disease exists in practically all parts of the country. In some sections the disease is much more prevalent than in others, therefore, the economic importance of the disease will vary in different localities. There is no question, however, about this disease being responsible for severe losses in individual flocks, and for the nation as a whole the losses run into many thousands of dollars annually. Although the control of blackhead has been highly successful, the turkey industry should consider this disease a sleeping giant that may cause dreadful losses if aroused by neglect or improper management.

Fortunately for the turkey growers of today, scientists have learned enough about the cause and nature of this disease so that successful methods of keeping it under control have been worked out. At present there is no treatment or medicinal agent known that is a practical, efficient remedy for infected birds. Control depends upon prevention and not upon treatment for infected birds.

The name "blackhead" has misled a great many turkey grow-

Reprinted by permission from the Turkey World, Mt. Morris, Illinois, May, 1945

ers because there are many cases of this disease that show no discoloration of the head. On the other hand, there are many other diseases of turkeys that may cause discoloration of the head and thus, the name blackhead leads to confusion.

Blackhead is caused by a one-celled animal parasite *(Histomonas melegridis)* that is so small it requires a microscope to see it. Turkeys become infected by eating droppings or other material that is contaminated with the parasites. This parasite is not able to stay alive in droppings or soil for long periods of time unless it is protected. When it was discovered that the eggs of the tiny round worms that infest the ceca (blind poches) of chickens, turkeys and other fowls may harbor and protect the blackhead parasite, it revealed an important factor in the nature and spread of this disease.

Blackhead is primarily a disease of turkeys, although the disease has been observed in the chicken, pheasant, grouse, quail and peafowl. It has been established that the chicken often harbors this parasite in its intestinal tract and shows no symptoms or other evidence that it is a carrier of the cause of this disease. This "healthy carrier" status sometimes is found in mature turkeys and it is undoubtedly one of the biggest stumbling blocks in the way of a program that might lead to complete eradication of the disease. The fact that chickens are "healthy carriers" of this parasite has led to the often repeated warning that chickens and turkeys should not be raised together.

The blackhead parasite being protected by the egg of the cecal worm is a unique biological arrangement that is not understood completely, although from a practical standpoint, it is not necessary to know exactly how this protection is gained in order to devise a program of management that will aid in preventing the spread of the disease. The protection afforded the blackhead parasite by the worm egg may mantain the infection on a badly contaminated range for over a year. It is, therefore, important for turkey growers to provide alternating ranges that will allow a period of 18 to 24 months during which no birds are allowed to occupy the range. Further, during such a resting period, the range should not be fertilized with droppings from chickens, turkeys, or other fowls. The range does not need to be left idle. When the range is suitable for cultivation, it is advisable to grow one or more crops during the period it is not used for turkey range. Although many turkey growers have been able to get by without a planned program of range rota-

tion, it does not follow that all of them will be so fortunate. It must be remembered that disease transmission is subject to all sorts of variations that constantly alter the possible chances of picking up infection. A program of planned disease prevention, therefore, should be given top priority in the management program of all turkey raisers.

When droppings or other material contaminated with the blackhead parasite are eaten, the parasites apparently are incapable of living and producing the disease unless they can find their way into the ceca. Experimental evidence indicates that when unprotected blackhead parasites are fed to turkeys, that frequently the parasites are unable to withstand the trip through the digestive tract and to find the cecal tissue that they require for growth and reproduction. If large doses of the parasites are repeatedly fed, the chances of establishing infection with unprotected blackhead parasites increases. One can reason readily from this that insanitary conditions, overcrowding and other faulty management of this nature will increase the number of available blackhead parasites and will be a definite influence on the number of cases that may develop. On the other hand, feeding contaminated cecal worm eggs that protect the blackhead parasite increases considerably the chances of it successfully finding the cecal tissue essential for it to live and reproduce.

The nature of an outbreak of blackhead varies according to the age of the turkeys infected. In young turkeys under 8 weeks of age the disease has a sudden onset, a rapid course, and is highly fatal. The disease may progress so rapidly in young poults that death often occurs before the highly characteristic liver lesions, seen in older birds, have an opportunity to form completely. The cecal lesions usually involve both ceca completely. The ceca appear distended with cheese-like material that seems to be attached to the mucous membrane and the outside wall of the ceca appears intensely congested.

In mature turkeys the disease usually takes a slower, more chronic course, and under suitable circumstances many birds may recover. After the parasites enter the ceca and establish themselves in the cecal wall, they work their way into the blood vessels and are promptly carried by the blood stream to the liver where characteristic lesions are produced. Symptoms and lesions may develop within 7 to 10 days after the parasites are consumed.

Sick birds do not show symptoms that are characteristic of this disease only. They are droopy, lose their appetite and stand with the wings held loosely.

Some infected birds may pass a slimy, sulfur-colored dropping that is quite suggestive of blackhead. Although lesions of blackhead are quite characteristic, when they are associated with other diseases variations may occur that cause confusion. In case there is any question whatsoever about the diagnosis, specimens should be submitted to some competent person, such as your local veterinarian or the poultry disease laboratory at your state experiment station. An accurate diagnosis is the first essential to a successful program of disease control.

When an outbreak of blackhead is encountered, immediately try to determine the source of the contamination so that it may be taken care of promptly. This may be a chicken or turkey yard or a pile of chicken or turkey manure. The writer has encountered numerous outbreaks in turkey poults in brooders equipped with wire-floored sun porches. The source of the infection proved to be contaminated flies that were breeding by the millions in the droppings under the sun porches. Disposal of the droppings and fly control, with special sanitation in the brooder house has brought these outbreaks under control. If the outbreak is in mature birds on range, it may be more difficult to locate the source of contamination.

The next step is to remove and quarantine all sick birds. Dead birds should be burned promptly or buried deeply (4 feet or more). In the case of mature turkeys, sick birds respond quite well if they are confined to a house or room that has litter on the floor so it may be cleaned out every 5 to 7 days. Birds that recover under such treatment should be sold for slaughter and not be put back in the flock, because they may recover and become "healthy carriers." The well birds should be moved to a new clean range and watched closely for sick birds that may develop. The program of using temporary fence and moving the birds to a clean area of range every 7 to 10 days until the outbreak is checked, is advisable. When no further cases develop, the length of time between changes of range may be increased, depending upon the number of birds and the amount of range they occupy.

It has been mentioned previously that there is no practical, efficient medicinal treatment for infected birds. An erroneous belief has developed that phenothiazine is a treatment for blackhead. There is no basis for this implication. Phenothiazine has been shown to be quite an efficient remedy for the cecal worm whose eggs may harbor or protect the blackhead parasite. Thus, in a program of prevention and

control phenothiazine may at times serve a very real purpose, but as a treatment for birds infected with blackhead it apparently is worthless. If an infestation of cecal worm is found in the birds, treatment with phenothiazine would be desirable. It should be understood, however, that periodic treatments with phenothiazine should not be considered as a substitute for proper sanitation and a suitable range rotation program. When phenothiazine is used, it should be given according to the recommendations on the package.

The Using Horse of the West

Condensed from The Horse

Alex. Grant Swaney

It is scarcely possible to exaggerate the contribution of the horse to the exploration and development of the West. Without him the pioneering era would have been delayed by nearly a century. Without him the tempo of conquest would have been measured by the gait of the plodding ox, and upon this patient beast solely would have depended the opening to civilization of a virgin empire of almost two million eight hundred thousand square miles west of the Mississippi, from Texas to Saskatchewan. Without the horse the history of the period would have lost much of the aura of romance that colors any epoch through which men move upon horseback.

From colonial times down through the first decade of this century it has been the horse that has provided the individual transportation of man. The appellation, "Man's best friend" might well be applied to the horse in the sense that without him many of man's outstanding accomplishments in the early days of the nation would have been impossible. The horse of European ancestry imported into America carried the settlers westward over the Alleghenies into the great valley of the Mississippi and beyond. With his help the land was cleared, crops sowed, harvested, transported; with his help life was sustained. Then, once more, at the bidding of his restless master he moved toward the setting sun into that limitless land, that ocean of grass, the empire of desert and mountain that is the West of today, and there the horse of the Atlantic seaboard met a relative from a distant land, a relative come not in peace,

Reprinted by permission from The Horse, Washington, D. C., May-June, 1945

but in war; met the descendant of the Spanish Barb, of Arab blood, brought to the new continent by the conquistadors of Spain. It is about this horse and his successors in *use* that our story is concerned.

The Barb came to Vera Cruz with Cortez in 1519. Every ship from Spain to the Caribbean settlements carried horses. In 1598 Juan de Onate headed an expedition into the new land which settled thirty miles north of the present site of Santa Fé, and founded that city at a later date. History records that Onate's expedition promised to take 150 mares, 150 colts, 25 stallions and other livestock. The horses were Spanish Barbs. The Santa Fe settlement came to grief at the hands of Indians in 1682. Four hundred Spaniards were killed and their horse herds, undoubtedly descending from the original Onate herd, were dispersed among the Indians of the Southwest, and by 1738, according to Sieur de la Verendrye, horses were being used by a number of tribes inhabiting what are now the Dakotas, Montana and Wyoming.

It has been well established that the North American Indian had no horses prior to the coming of the Spaniard and that they were in general use among certain southwestern tribes as early as 1682-1700. The only possible source was Spanish importation —the Spanish Barb of Arab blood that was brought to Spain by the Moors in 710.

The mustang of the plains, the Indians' cayuse, the original western *using* horse carried royal blood!

Whenever man, in the course of his activities, has found need of particular qualities in a horse, human-like he has immediately set out to fulfill that need. During the course of centuries he has bred the Thoroughbred for racing and speed; the substantial Morgan for harness or saddle; the beautiful American Saddler for show and pleasurable riding; the splendid Arabian, that good companion and all 'round horse; the trotting Standard-bred; the sturdy and fast Quarter Horse for handling stock and for rodeo contests, as well as numerous others bred for color, markings, special abilities. All these breeds fill particular niches in the equine world.

Despite the automobile, the train, the airplane, despite all that modern scientific achievement has done to change the life of man from the design Nature apparently intended, the horse still plays a major role in the lives of Westerners. He is far from being replaced on the small farms and ranches and there is no present reason to believe that he ever will be.

Throughout the West great numbers of horses are used on stock ranches, in the federal field services, in the dude ranching industry, but perhaps more important, and as an indication that we have re-discovered a way of life, large numbers are owned and ridden for pleasure, and this number increases from year to year. Not only is this trend confined to the West. It is nation-wide. We are re-discovering the truth of the adage, "The outside of a horse is good for the inside of a man."

Should you ask a native Montanan, a horseman, what type of mount he prefers for general use, you would get the terse reply, "A stock-horse," perhaps accompanied by a quizzical look meaning that he might consider the question rather unnecessary. By stock-horse he would mean a *using* horse, one that would meet all of his requirements for work, sport, or pleasure. This *using* horse, which we shall henceforth call by the name *Smoky*, for easy identification, has been *the* light horse of Montana for generations. He has been the mount of the explorer, the free-trapper, the plainsman, the cowboy, and the mountain-man. Through the years his blood and his conformation have changed, but his use has not, except in degree.

But what are the attributes and characteristics of *Smoky*, this stock-horse, this *using* horse of Montana, and of the West? He is not a big horse. He will weigh from 950 to 1,100 pounds. In the past he has been rather smaller than now, for in these latter days often he carries the blood of Morgan; Thoroughbred, American Saddler or Standardbred. In the old days his breeding was cayuse or mustang, more often than not. Even now there is no definite type. Some are rangy, some are chunky, but all are tough as bull-hide. There are still thousands that are plain bronc.

Smoky must be a weight-carrier, and that means he must have a comparatively short, heavily-muscled back. Stock-saddles usually weigh about thirty-five pounds. With a muscular, better-than-average-sized cowpoke or mountain-man in the saddle, loaded down with the accoutrements of his calling, *Smoky* may well be carrying 225 pounds or more. He must carry this load breezily for 35 to 40 miles one day, and the next day, over country the aesthetes would call "scenic," but for which *Smoky* has another name. To carry this weight his legs must be strong and set straight under the "corners." Pasterns must be neither long nor short—long enough for easy riding, short enough for strength. His quarters must be powerful to enable him to start quickly and sustain pro-

pulsion, and to push him up steep, rocky mountain trails.

Smoky should be intelligent, calm but alert, quiet to handle but quick-on-the-trigger. He should be absolutely gentle in all respects, but alas, too often is not. For an average-sized rider his best height is around fifteen hands.

Since, among his numerous other duties, *Smoky* must handle stock, it is important that he be neither logy nor fretful, neither too slow nor too fast. If he is a good herder, and most stock-horses are, he will need little guidance from his rider, but will head without command. *Smoky* must be utterly fearless about entering herds of animals, even forcing his way through them; about handling bulls, crossing bogs, swamps; about fording swift, cold streams, jumping windfalls and other obstacles; fearless about sitting on his tail to slide down washes, and about scrambling out of them.

Smoky's powerful hindquarters must have him in full gallop in two strides, and he must stop from such a gait by ploughing his hind feet under him, never by crow-hopping on his front feet. This is not something that he is called upon to do occasionally, but frequently. It is not a trick, but a part of his trade, and it takes a better-than-average rider to sit him gracefully during his gyrations when heading an animal breaking from a herd.

Ropes of all kinds are a part of *Smoky's* daily life. He must respect them, but have no fear when they are used around him. He should be able to hold his own weight on the end of a lariat, and when necessary keep it taut even when his master is working at the end of it. This is one of his greatest and best-known accomplishments, for it is excelled in by his more brilliant equine brothers of the rodeo arena. However, any well-trained western stock-horse will do the same, though not in so spectacular a manner.

To those unfamiliar with western mountain travel some of the trails appear to be extremely dangerous, and potentially they are under some conditions. *Smoky* is expected to walk quietly and safely up a steep grade, often along a trail not over eighteen inches wide, across a mountainside of slide rock with a precipitous drop-off on one side and an unclimbable bank on the other. At this he never cocks an ear. The writer has heard of horses who, meeting grizzly bears on such trails, have stopped and calmly waited to see what would happen, rather than do what a horse normally would do under such circumstances—rear and fall or plunge in a frenzy of fear down the mountainside.

Mountain trails are often obstructed by windfalls (down trees). If they are too high for pack animals to step over or jump, a detour must be found, but sometimes in a country covered with heavy down-timber that is impossible, and resort must be had to the ever-present axe. Any true Montanan will not use his own power to do anything that a horse can do for him, and it would be a high windfall indeed that would prevent, at least, an attempt to jump. Under such conditions *Smoky* is expected to jump two and a half feet "off his hocks" from a narrow, rocky mountain trail, and he does it without much urging. While that is a trifling jump for the show ring, it isn't bad for a heavily laden animal on a narrow mountain trail, pressed behind by other horses and with the barrier almost against his chest.

One of the most exasperating experiences that can happen to a mounted traveler is having his horse get away. There are times when such an incident may be a catastrophe. Some method of securing is absolutely necessary, in the absence of enclosures, especially among horses that are comparative strangers and apt to break up into cliques and make for their home ranges. Quite obviously an animal must have sufficient freedom to graze, for only rarely is feed carried. *Smoky*, unless he is a very exceptional animal and turned loose to forage, will be picketed at the end of a 40- or 50-foot rope, hobbled, or herded for two hours or so at grazing time before being tied for the night. In this event he is grazed again at sun-up for a time.

Arguments have been going on between Westerners for almost a century as to whether picketing should be by the neck or by the foot. There are arguments for and against each method. Doubtless it never will be settled. Proponents of the "neck" method maintain its superiority on the grounds that an animal is less likely to seriously injure itself if it becomes frightened and runs. Opponents of the method maintain that a neck-picketed horse is more apt to become rope-burned, tangled, or both, than if the line is tied to the near front foot, especially if the foot rope is secured to a drag rather than tied fast. As to injury resulting from running against the end of a 50-foot tied-fast picket rope, the foot-tie people say, "which is worse, a broken neck or a broken leg; either means a dead horse." So here, perforce, we must drop the argument where it has been dropped countless times before, but we drop it with this thought: That if *Smoky* knows his picket rope as he should, either method may be used, for it is likely that

due to past experience he will see that the rope does not burn his heels, and should he become entangled he will not struggle, but patiently wait to be extricated by his master.

There are times, too, when *Smoky* must carry double for a short distance. He is expected to do it quietly without protest, like a gentleman.

It seems a small thing, but it is really important in the West, that *Smoky* should stand under saddle, even for hours, with his reins "tied to the ground," that is, not tied at all. This, perhaps, is the most common of his virtues. He may nibble about if he is hungry, but it would be against the established code were he to graze far. This seemingly strange fact was born of necessity. Often in the plains country there is nothing to tie to! The writer often rides in Montana with twenty to thirty people. When a rest stop is made scarcely a horse is tied. For hours on end *Smoky* will stand *tied* with his reins merely thrown over, not secured, to a rail or limb of a tree.

Smoky has his vices, but he doesn't have many. He knows his rights, and one is this: That he shall not be cinched too tight on a cold morning, mounted and forced to start out at a fast clip. Such an unwise and unwary rider would find himself deposited with great finality upon the hard bosom of Mother Earth. Too often *Smoky* and his kind are not easily caught when running free, and of all his vices perhaps this is the worst. Even when corralled he will dodge, reverse and hide behind a fellow, rather than submit tamely to a rope, but once haltered he is eager for work.

Smoky's virtues are known throughout the English-speaking world. During the Boer War in South Africa in 1902-03, when it was found that the English cavalry horses could not stand up under the rigorous campaign conditions, the British War Office, upon the recommendation of Lord Kitchener, Commander-in-Chief, imported 100,000 of *Smoky's* kind from out West to re-horse the cavalry. It takes no stretch of the imagination to believe that a good many Tommies got a *rise* out of these ponies. True to their heritage, they showed great stamina and hardihood, and proved to be good cavalry mounts.

The unknowing may believe that the type of western horse we have personified by *Smoky* is the figment of a romantic imagination. True, many fall short of all the accomplishments we have set forth, but there are hundreds, thousands, who do all and more. Though their breeding may have changed, today they are substantially the same type that carried man on his great adventure

in the West from the time of the conquistadors down to our day.

There are faster horses, more beautiful horses, more spirited horses, but there are none more courageous, more enduring, more useful, or none which have done more to further the interests of their masters. They have been beasts of burden, but companions too; companions in the merciless thirst of the desert, companions in the cold and starvation of winter, when cottonwood twigs and bark were the only forage in a swirling, bitter world of whiteness.

For generations *Smoky* and his kind have carried the destiny of Mankind in the empire that is the West. They are not being forgotten in the land that is their home.

Raising Calves at Mare Island

Condensed from Holstein-Friesian World

Col. Arthur Racicot

The U. S. Naval Prison Farm at Mare Island, California, is developing an outstanding Holstein herd under direction of Col. Arthur Racicot. Col. Racicot is a graduate of Massachusetts State College and a keen student of genetics. So successful has been their system of calf raising, and so frequent the requests for detailed information from people who have seen it in operation, that Col. Racicot has set it down on paper in full detail.

Our calf raising methods are fitted to the conditions we have here at Mare Island where we have no grazing land and raise no feed. All feed has to be bought and pen fed. We do not claim it is the only way to raise scours-free calves.

The important principles that must be met without compromise are few and simple:

1. A healthy calf to start with.
2. Cleanliness.
3. Regularity of feeding.
4. A balanced and adequate feeding.
5. Never overfeed.

Any other plan that meets these requirements will succeed.

We have raised our dairy calves without a case of scours since October, 1941.

We wean them at 30-days and go on an all dry feeding schedule.

The system costs less and is safer than older methods.

Reprinted by permission from Holstein-Friesian World, Laconia, N. Y., May 5, 1945

At six months of age our calves are vigorous and are above average for age.

In the spring and summer of 1941 we were having the usual amount of calf scours and some losses. We investigated every source of information and advice we could lay our hands on and, after several trials, we combined what appeared as the best features based on practical considerations. By October, 1941, we had it licked.

From our investigations we gathered some interesting facts.

In the grown cow the first stomach (paunch or rumen) is ten times larger than the fourth stomach, but, when the calf is born the first, second and third stomachs together are less than half the size of the fourth stomach, and digestion takes place only in the fourth stomach, the others being used for storage and the preparation of feed.

Furthermore the fourth stomach of the new born calf will hold, when filled up, about 2 quarts or less. If you give the calf too much milk it overflows into the upper stomachs where it cannot be digested, forms hard curds and in the paunch it may putrify. Result of overfeeding is scours. It is clear then, that milk should be fed not less than 3x daily and never more than 3 pints at one feeding to avoid crowding the stomach. Play safe on this point.

Another important point is that when a healthy calf is born and gets a good feed of colostrum the first two days it starts with a good supply of Vitamins, but in two or three days this is used up and the dam's milk, especially a high producer, frequently does not provide enough concentration in a gallon a day fed the calf, and so it is necessary to provide the deficiency. We have found the most convenient way to do this is to start the calf on first day and continue until a few days after weaning with one Vitamin Capsule a day. There are many on the market. Insist on getting one with the full quota of A, D, C and Niacin, the Phillips formula. Some on the market will short change you. When the calf is three weeks old and fed properly, it begins to manufacture its own Vitamin C and Niacin so when weaned it is only necessary to provide A and D in the feeding. These four Vitamins are necessary to resist infections, keep digestive organs working properly and maintain appetite. A 100-pound calf needs 3.25 grams per day of phosphorus and sufficient amount of Vitamin D to properly use the calcium and phosphorus provided in the feed. The calf pellets and the grain mix used will supply this after the calf is weaned. You will no-

tice we use quite a small amount, only five percent dried skim milk in our grain mix. Skim milk is an excellent source of calcium and phosphorus, but to use a high percent in the mix would raise the protein too high for a well balanced ration, so we make up the need for phosphorus in the oil meals and bone meals. In addition, dry skim milk can make calf feeding expensive, and the more economical ingredients will work all right.

The grain mixture given has worked entirely satisfactorily with us. Any other mixture properly balanced would no doubt do as well.

We Follow These Five Rules

1. One must start with a healthy calf, healthy at birth.

2. Strict sanitation from birth until at least 10-weeks old, to get through the critical period and bring the calf thru healthy and strong.

3. Make absolutely sure never to overfeed the calf, but feed him carefully to keep him lusty and growing without set back.

4. A calf worth raising is worth spending the necessary labor and expense to do the job right. It is a good investment. If a calf is not worth that expense, cull it—right away—it will be a poor investment and a waste of time and money.

5. Organize your calf layout and routine carefully and the cost will be reasonable and prove to be an excellent investment.

Before Calving

For a healthy calf to start with, we dry our cow sixty days before calving date and feed her enough fourteen percent protein grain mix to finish her off in good flesh, not too fat at calving time. Sixty days before calving, the unborn calf is only one-third grown. It must make two-thirds of its birth weight in the last sixty days. You must give the dam good feed and rest for this job. We have an open shed giving us four box stalls. A week before calving we put her in a box stall and feed her a light laxative feed. When the calf is dropped we cut the navel cord and sterilize it with iodine. The calf is left with its dam 48 hours, then put by itself in a small 4x6 ft. stall in the calf barn. We believe the above is important in giving the calf a right start. We find this pays profits. We have raised our herd average to over 500 lbs. fat the last two years, and get healthy calves. It pays both ways.

Handling the Calf

1. We start the calf with one Phillips Calf Capsule and give him one each day until weaned from milk. We wean them at 30

days old, after which all feeding is dry. Keep dam's udder clean.

2. On third day, 12 hours after separating from dam, we feed one and one-half pounds milk 3x daily—feed nothing else first day. We select milk as close to 3.5 percent as we can, feed it 100 degree temperature from a sterilized bucket, and feed it through a sterilized rubber nipple. We rigged up a home made gadget for this—it is a piece of rubber tube cut from a rubber air tube from the milking machine, and the nipple fastened by a hard rubber connector. The whole thing is easy to clean and sterilize. Lately, we have seen a rubber nipple advertised for use on a regular quart and 2-quart milk bottle. This looks as if it might be better than our rig, although we have not tried it.

3. We increase milk feedings by one pound each day until calf is getting 8 lbs. (one gallon) per day of whole milk. Never more. (Small calves not more than 6 lbs. per day.)

4. Feed dry Calf Pellets starting day after calf has learned to drink milk from nipple, and work him up to eating one pound pellets at three and one-half to four weeks old—then wean him.

5. The calf will need more feed, so we start giving him small amounts of a grain mix when 10 days old and increase this as fast as he can handle and clean up in 15 minutes. We never feed the grain until the calf pellets have been cleaned up. He must take his pellets first as this is the part of feeding that will replace milk when calf is weaned.

6. The above gives you our regular practice as used on most of our calves. Once in a while one turns up that won't feed as easily as the rest and we carry that one a week or two longer before weaning. We get him right before shifting to all dry feed.

General Directions

A. We wean calves at 30 days, after that all feed is dry.

B. We feed no alfalfa until calves are six months old. Alfalfa hay varies too much and high protein makes control difficult.

C. After third week if calf is not eating more than one-half pound Calf Pellets he is behind schedule. We then cut his milk to half to make him hungry—it always works—he soon catches up on Calf Pellets. The goal we work for is to get the calf eating a pound of Calf Pellets at 4 weeks so we can wean off all milk and go on an all dry feed schedule. From then on feeding is simple.

D. After calf is weaned we continue feeding 1 lb. Calf Pellets total per day (never more) and increase calf grain mix to

what he can handle and clean up in 15 minutes. 3x daily working up grain feed to 4 lbs. per day.

E. We always follow this order strictly: 1. Milk; 2. Calf Pellets; 3. Grain Mix; 4. Hay. Calf eats not much hay and needs the concentrates first. They should always be fed in the above order. No use feeding grain until calf has cleaned up. Keep his appetite sharp.

E. Size, not age of calf, determines how much feed it needs to grow thrifty. The first 6 months we feed them one pound a day of Calf Pellets and work them up to 4 lbs. grain mix. After 6 months we drop out calf pellets and feed just grain mix. When calves can eat plenty of good hay, we cut down to needs to keep them full growing—good flesh. Judgment and a good eye is the guider from here on.

Care and Feeding Schedule
Young Calves

1. a. Keep everything clean.
   b. Feed milk at 100 degree temperature.

2. MILK
   a. Start at one and one-half lbs. three times a day.
   b. Feed one Phillips Calf Capsule once a day.
   c. Increase each day's milk total by one pound.
   d. Not more than 8 pounds per day limit. (Small calf not more than 6 pounds.

3. CALF PELLETS
   a. Teach calf to eat.
   b. Begin on third day and increase as fast as it will eat—up to one pound per day.
   c. Until calf eats one pound per day, give it all it will clean up in fifteen minutes 3x daily.

4. GRAIN AT 10 DAYS
   a. Begin feeding small amounts of grain at noon.
   b. Feed grain after calf pellets.
   c. Feed grain up to what it will clean up in fifteen minutes once a day—noon.
   d. When calf handles grain OK then feed grain twice a day.
   s. Grain mix — calf formula given below.

5. HAY (Begin at 2 Weeks)
   a. Carefully select clean, fine stem hay (Best quality grass or oat hay—no alfalfa).
   b. Put small amount in hay rack fresh every day after grain is eaten.

6. START WEANING MILK
   a. When calf is eating one pound calf pellets per day.
   b. First drop out noon milk.

c. Second drop off one-third of milk every other day until weaned.

7. a. Common sense must be used.

b. Bring the calf along at the rate it can take.

c. After weaning, calf capsules dropped from feeding schedule. Calf grain mix provides necessary minerals and vitamins.

See grain mix directions below.

Calf Grain Mix

The grain mixture used at Mare Island Dairy Herd for calves up to 6 months of age, has been carefully balanced. To provide vitamins A and D we use 5 pounds of Bospro (Borden product) per mix. We used to provide these vitamins by using Nopco XX oil in the milk and on the dry feed. Now we use Bospro directly in the mix and save the bother of handling the Vit. oil. The manamar provides iodine, fish meal and all trace elements. If we could get real 100 percent wheat bran we could modify this mixture and cut down on the minerals. The problem is to provide enough phosphorus. With wheat bran hard to get we find the minerals in our present formula give an overall sufficient amount. Calves should have daily around 3.25 grams of phosphorus per hundred pounds live weight. If you find your calves chew woodwork or eat dirt, and you are sure your feeding is O K, check up on phosphorus and vitamin D. They are needed together and in sufficient amounts.

The ingredients of our calf grain mixture:

15 Lbs. medium ground or rolled barley.

50 Lbs. medium ground yellow corn.

75 Lbs. medium ground oats.

10 Lbs. dried skim milk.

25 Lbs. linseed meal.

10 Lbs. cattle manamar.

5 Lbs. Bospro (Borden's).

1½ Lbs. steamed bone meal.

2 Lbs. limestone flour.

1 Tablespoon irradiated dry yeast.

5 Lbs. Salt.

"Hormone" Sprays for Greenhouse Grown Tomatoes

Condensed from Market Growers Journal

A. E. Murneek and S. H. Wittwer

Missouri Agricultural Experiment Station, Columbia, Mo.

In growing greenhouse tomatoes it is often difficult to obtain a satisfactory set of fruit during the winter and spring months, when the days are short and light intensity is low. No cultural practice has been found to overcome this trouble. A few years ago it was discovered that certain chemicals, known now as plant "hormones" or "growth substances," when applied as sprays to flowers or to entire plants, would increase fruit setting and size, sometimes remarkably. Such "hormone" sprays are becoming popular among tomato growers in certain parts of the country.

The use of these substances in growing tomatoes has been investigated thoroughly during the past four years at the department of horticulture of the Missouri agricultural experiment station. It is believed that the results of this study may be of considerable interest and practical value not only to growers of our state but elsewhere.

"Hormone" sprays are no substitutes for any necessary and accepted practice in raising tomatoes. They are used only supplementary to good cultural methods. Commercial tomato producers usually are as experienced in handling their crop as any group of growers, but in the rush of work and business they too may occasionally overlook certain requirements for greenhouse tomato growing.

Only sturdy well developed plants, that have been raised in properly fertilized soil, have been amply spaced and transplanted with least disturbance to their root systems, are able to develop properly, to form vigorous flowers and set fruit on the first or first two flower clusters.

Pollination is required for satisfactory fruit development. Without it, no seeds will be formed. The more seeds the larger and better is liable to be the fruit. Seedless or partly seedless fruit are frequently small and sometimes "puffy." Every effort, therefore, should be made to pollinate the flowers. Sunlight probably is the chief factor in pollen production and distribu-

Reprinted by permission from Market Growers Journal, June, 1945

tion. A prolonged period of cloudy weather usually means poor pollination and fruit setting. Too much shading, as occurs when plants are grown close together, has the same unfavorable effect on flower development and performance.

In training plants to a single stem, which seems to be a universal practice it is desirable to remove the side shoots promptly. Topping of the main stem, at whatever height this may be done, likewise will preserve the vigor of leaves and flowers. Excessively large flower clusters, with an ample set of fruit already present, should also be headed back. These pruning and training practices will help to throw all the possible strength into the development and maintenance of vigorous leaves and flowers and the production of fruit of a desirable size.

Tomato plants, especially when fruiting, are voracious feeders on soil nutrients. Usually it is not possible to have the greenhouse soil so rich that all elements will be present in adequate quantities throughout the life of the plants. When they have become quite large and fruit production has progressed to a certain point, nitrogen most often becomes a limiting factor in their growth. It is commonly replenished by a side dressing of a nitrogenous fertilizer, preferably nitrate of soda or ammonium nitrate. A yellowish tinge of leaves high on the plant, reduced growth and leaf size are clear cut signs of nitrogen shortage. Often this is preceded by a reduced size of the flowers and lack of fruit setting.

Greenhouse men know well enough that plenty of light is needed for proper development and performance of tomato plants. One of the chief reasons why tomatoes are not grown extensively in greenhouses during the winter months is lack of sufficient light. Beginning early in March the days become long and bright enough for tomato production. A few growers have been successful in raising a crop early in the fall (September and October), when the days are still quite long and relatively sunny. A well placed and constructed greenhouse and proper spacing of plants go a long way toward the securing of a maximum amount of light.

Tomato plants require not only a rich soil and light in abundance, but also plenty of fresh air. During fair and warm weather, ventilation of a greenhouse is usually satisfactory, but it may be very limited when it is cold outdoors. The material that makes a tomato plant and its fruit is derived chiefly from carbon dioxide of the air. Since air contains only .03 per cent of carbon dioxide by volume, it may conceivably run

short when a well constructed greenhouse, full of large plants, remains closed for a long time. Ventilation, whenever possible, will replenish it.

These sprays, as was stated before, have been devised for the specific purpose of increasing fruit setting and size and, thereby, the yield of tomatoes when they are grown under conditions of low intensity. Pollination and seed formation is then reduced to a low point. *They are not substitutes for pollination but are used supplementary to it.* A large number of chemicals have been found effective for this purpose, some more so than others. We have tested repeatedly almost all of them.

The two substances found most desirable as hormone sprays are: B- Naphthoxyacetic acid (NOA) and p-chlorophenoxyacetic acid (CPA). In water solution they can be used either for spraying the flower clusters or the whole plant. We have found whole-plant spraying more effective, often remarkably so, than flower cluster spraying to increase the number and size of fruit. Though this is a quick and efficient method to apply hormone sprays, there is some danger in it. By wetting the leaves, molds and other fungous diseases, if present, may be encouraged and, in cloudy weather, it is easy to apply too much of the material. This may result in abnormal leaf and fruit development, particularly when CPA is used. Flower cluster spraying, therefore is more popular at present, but whole-plant spraying should be tried by all means.

Preparation of the Material for Flower Cluster and Whole-plant Spraying

A. Stock solutions (Either **NOA or CPA).**

Dissolve 10 grams of the pure chemical (crystals) in 1000 c.c. (about 1 quart) of either grain or wood alcohol (must be pure and strong). Keep in a glass jug, labeled.

B. Dilutions for flower cluster spraying.

1. For NOA—50 p.p.m. (Parts per million).

Draw with pipette 5 c.c.* of NOA stock solution. Add enough water to bring it to 1000 c.c. (about 1 quart).

2. For NOA—75 p.p.m.

Draw 7½ c.c. of NOA stock solution. Add enough water to make 1000 c.c.

3. For CPA—10 p.p.m.

Draw 1 c.c. of CPA stock solution. Add enough water to make 1000 c.c.

4. For CPA—15 p.p.m.

Draw 1½ c.c. of CPA stock solution. Add enough water to make 1000 c.c.

C. Dilutions for whole-plant spraying.

1. For NOA—20 p.p.m.

Draw with pipette 8 c.c. of NOA stock solution. Add enough water to make 4000 c.c. (about 1 gallon).

2. For CPA—1½ p.p.m. (For the venturesome only).

Draw with pipette 0.6 c.c. of CPA stock solution. Add enough water to make 4000 c.c.

Application

It is most convenient to apply the diluted spray solution to flower clusters by means of a hand spray. A knapsack sprayer, if available, may be even more handy. During very cloudy weather, use either NOA-50 or CPA-10; in partly sunny weather use NOA-75 or CPA-15.

* 1 teaspoonful = 5 c.c.
1 tablespoonful = 15 c.c.

We have found it convenient to wet the flowers one or two days after pollination. But even older flowers may be induced to form fruit by these hormones. Spraying every five to seven days should be satisfactory. No harm is done, and there may be an advantage, by spraying the flowers and young fruit more than once.

In spraying whole plants, they should be wet thoroughly with a misty spray once a week, beginning when all the flowers on the first cluster are open and some may have set already. Stay away from the tips, the young leaves, as much as possible. A wheel barrow sprayer, hand or power driven is desirable for this purpose. In cloudy weather the CPA spray may modify leaf development, but watch for a marked increase in size of fruit.

What May Be Expected

In our experimenst, we have obtained increases in fruit setting from six to sixty per cent and in size of fruit from naught to as much as fifty per cent. Thereby a substantial improvement in yield has often been secured. In general, the best results may be expected during cloudy weather in spring and early summer, such as we had last year (1944) in March and April. Hormone sprays did not have any beneficial effects on tomato production outdoors, under field conditions, last summer.

These sprays will not prevent the poor development and performance, or even dropping of flowers on the upper clusters. This is caused by the withdrawal of food materials by the developing fruit lower on the stem. As soon as they will have ripened or have been removed, the top of the plant usually is rejuvenated and fruit will be produced again. The poorer the soil or the less light, the sooner the terminal flowers will be weakened by an early crop of fruit. Timely application of nitrogen may be helpful.

Can hormone sprays have any undesirable influence on the crop? Usually not when properly

applied. In very cloudy weather, and with extremely poor pollination a large number of small seedless fruit may be formed than would normally occur, but this in no way will cut down the possible production of other larger fruit. Occasionally a few fruit may be more "puffy" than desirable when too much of the CPA spray is applied. This, too, occurs only when the weather is bad for pollination. The quality of tomatoes from hormone sprayed plants, including their vitamin content, was found to be the same as that of fruit from untreated plants.

The Future of Poultry Breeding

Condensed from New Jersey Farm and Garden

Dr. Paul D. Sturkie
Rutgers University

WHAT does the future hold for the poultry breeder? Will the breeder be able to increase the level of egg production and livability above that of our present day "better flocks?" Before attempting an answer, let us consider what has been done in the past and what problems confront the breeder of the future.

It is generally agreed that over a period of years we have succeeded in increasing egg production from an average of 80 eggs per bird to 200 or more eggs. The evidence at hand indicates that most of the improvement came about in a relatively short period of time. Some of the contest records show that average egg production even 20 years ago approached 200 eggs. How much above 200 eggs have we increased average egg production? In so far as contest records are indicative of what has happened in general flocks, the increase in the past 18 years has been very modest, if not insignificant. An analysis of the egg-laying contest records of New Jersey for the years 1925-26 —1943-44, inclusive, shows that average production of the birds completing the laying year in 1925 was 194 eggs, and 229 eggs in 1943, an increase of 35 eggs, or approximately an average of two eggs per year for the 18-year period. About half of this improvement (18 eggs) occurred in the first four years. During the last 14 years production increased only 17 eggs per bird.

What proportion of the above improvement was due to breeding and what part was due to environment (feeding, management,

Reprinted by permission from N. J. Farm and Garden, Sea Isle City, N. J., April, 1945

etc.)? This cannot be ascertained directly; we can only infer. A statistical analysis of egg-laying contests in Canada made by Munroe in 1936 throws some light upon this question. He concluded that from 75 to 80 per cent of the increase in production occurring in the contests over the years was due to environmental factors and the remainder to genetic ones.

While some may question the basic assumption upon which Munroe's analysis was made and thereby the reliability of his conclusions, no one will deny that environment has played an important role in the improvement of egg production, particularly when one recalls the notable advances made in poultry nutrition in the past two decades. If we conservatively estimate that half of the increase in production evidenced in the New Jersey contest records was due to heredity, then the increase for the 18-year period due to breeding amounts to 17 to 18 eggs and for the 14 years, eight to nine eggs.

What Progress Against Mortality?

What progress has been made in decreasing mortality in the laying flocks? Judging from the contest records, little or nothing has been accomplished. The mortality during the 18-year period at the New Jersey test remained essentially unchanged. It amounted to 20.14 per cent in 1925 and to 19.23 per cent in 1943. In unselected flocks, the death losses run much higher, probably in the neighborhood of 40 per cent or higher, where culling is not practiced. However, a number of experiment stations in this country have demonstrated that adult mortality, particularly from leukosis, can be decreased by breeding. This was accomplished, in most cases, by a program of progeny and sib-testing, but which certain resistant families were developed.

A possible explanation as to why more improvement in egg production has not resulted from breeding follows. Not much is known about the inheritance of egg production. It is a very complicated problem since it is known that the formation and laying of the egg involves a number of complicated physiological processes, some of which are influenced to a considerable extent by environment. Thus, the interaction between environmental and hereditary factors makes difficult an analysis of the inheritance of egg production. As few as eight pairs, and as many as several hundred pairs of genes have been suggested, which determine egg production. Since heredity and environment interact to condition a certain level of production, it is possible for two birds laying the same number of eggs (same

phenotype) to vary widely in their genotypes, or breeding ability. A number of workers have demonstrated in the past that, in most cases, the production of a given ham is not significantly correlated with the production of her daughters. Or to state otherwise, phenotype is not a reliable indicator of genotype.

The low order relationship existing between production of dam and daughters may be due, in part, to the fact that too much emphasis has been placed upon the selection of high producing individuals (phenotypic selection) as breeders, with little or no regard to the flock or family as a whole. A high laying dam may or may not produce high laying progeny. If all, or a majority of her sisters, her dam, and her aunts were good layers, and if she is mated to a sire from an equally good family, then the chances are good that her daughters will be high producers. However, only the records of her daughters are proof of her breeding ability. Thus, it appears that if substantial improvement is to be made in raising the level of production and livability in our better flocks, then breeders must employ to a much greater extent progeny and sib-testing in the future.

An example of the selection of breeders on the basis of progeny, and sib-tests are contrasted with selection of a high laying individual (phenotypic selection) follows:

Two dams, A and B, each laid 240 eggs of standard size, and each had 10 daughters which were trapnested.

Egg Records of Daughters of Dam A	Egg Records of Daughters of Dam B
140	208
155	214
165	216
180	225
190	230
210	240
220	242
250	250
260	260
285	270
Average production per daughter	
205.5	235.5
Range in egg production	
145.0	62.0

The above figures represent a progeny test for dams A and B and sib-tests (sisters) for any one or more of the sisters of either dam. It is obvious that dam B is superior to A because the average production of her daughters is higher than those of A and the range in production of the daughters is considerably less. Because of this greater uniformity of production in daughters of dam B, any one of her daughters should be a better breeder than even the highest producing daughter of dam A, since the latter most likely would produce progeny also

showing great variation in production and a relatively low average.

The breeder who practices selection of high laying individuals without regard to family testing would have selected the 285-egg bird of dam A as a breeder.

In regard to the foregoing example, let us suppose that the breeder, instead of trapnesting all 10 daughters of A, culled during the course of the year the five lowest producers, or that they died, and considered only the records of the five remaining daughters which turned out to be the highest layers. The average production of the remaining ones is 245 eggs, a figure considerably different from the 205 recorded for dam A when all daughters were tested. Thus an incomplete and unreliable picture of the breeding worth of the dam and the sibs is presented.

A minimum of eight and preferably more daughters per dam should be tested for egg production, egg size and livability for a year period. If only a portion of the daughters are tested, these should be selected at random. In other words, no attempt should be made to select the best physical specimens for test and disregard the remainder. However, if all the daughters of laying age of a given dam are not physically fit to test, those that are culled, and the reason for culling, should be recorded against the dam. Those daughters entered for testing which die, or which are culled during the course of the laying year, should also be counted against the dam. To properly evaluate the breeding worth of the dam and sibs, the record should be as complete as possible.

The poultryman should select, in the case of progeny-tested dams, those whose daughters exhibited the highest average production and uniformity of production as well as the lowest mortality, provided no culling was practiced, or if practiced, was considered. Likewise, the better daughters of such dams may be used as breeders. Dams that have been tested up to the time of the breeding season (a limited progeny test) may be used in the breeding pens provided the records of their daughters for egg production, egg size, and livability are satisfactory. The better daughters of these dams may also be used. Since this sort of test is a limited one, the requirements for those selected should be higher than for those selected upon the basis of complete tests. Particularly is this true concerning livability. Progeny-tested males should be selected on the same basis as progeny-tested females. In selecting the breeding cockerels, choose a brother to the sisters whose average production and livability were good.

One Pound of Grain for 10.7 Lbs. of Milk

Condensed from American Agriculturist

Roe McDanolds, a dairy farmer in North Haverhill, Grafton County, New Hampshire, has developed a Ladino-pasture-hay program on 80 acres of tillable land which supports 20 Holstein cows that averaged 12,000 pounds of milk and 440 pounds of fat per cow for the ten years 1933-43. In 1943, according to D.H.I.A. records, these 20 cows averaged 13,030 pounds of milk and 459 pounds of fat. All feed was grown on the farm with the exception of 1,220 pounds of grain per cow or one pound of grain to 10.7 pounds of milk. No grain is grown on this farm. Better hay and pasture is the key to success.

The management practices on this farm are quite different from those in effect several years ago. Mr. McDanolds took possession of this farm in 1927 and found the following management practices in operation:

1. The cropland consisted of 60 tillable acres, 10 of which had grown up in bushes.

2. About 7 acres of corn was grown annually for silage and 15 acres of oats were cut green for hay.

3. The regular hay crops consisted of a mixture of red clover, alsike clover and timothy.

4. For pasturage, the cows roamed over an area of 125 acres of native permanent hill pasture, which is located four miles from the farm homestead and is known as the back pasture.

5. The cows remained out in pasture during the entire summer and were milked in the milkshed out in this back pasture. This practice was very inconvenient and time-consuming.

6. The tillable land was not used for pasture because of the lack of adequate fencing. The pasture available to the cows was of very poor quality and offered only limited grazing in mid-summer when it was most needed.

7. The animals on the farm consisted of 30 grade cows, a few young stock and two work horses.

8. It was necessary to purchase about 15 tons of hay per year.

Mr. McDanolds, an enthusiastic dairyman, was determined to make the farm business a success. He was convinced that pasture and hay improvement would pay big dividends.

Reprinted by permission from the American Agriculturist, Ithaca, N. Y., May 19, 1945

The size of business was limited because of the lack of enough tillable land. In 1938 he bought 20 acres of fertile level land adjacent to his farm. At this time the cows were increased to 20 after having been dropped to 16 two years earlier because of an unfavorable milk price and a limited feed supply. Soon after the new land was added to the home farm, the pasture improvement program had been developed to the extent that all cows were pastured on the tillable land, leaving only the young stock to graze out on the permanent back pasture.

Spring is seeding season on this farm. Land is plowed, harrowed and heavily fertilized in the fall and seed broadcast in March as frost begins to leave. The seed mixture is made up of approximately 6 pounds timothy, 4 pounds red clover, and 2 pounds Ladino clover. With this mixture, he gets an excellent stand and does not need to use any companion or nurse crop.

Mr. McDanolds believes in "setting a full table" for his roughage crops, applying an equivalent of about 150 pounds of sulphate of ammonia, 200 pounds of 47 per cent superphosphate and 200 pounds of 60 per cent muriate of potash and a ton of lime per acre. This application is applied in the fall. First year seedings are top-dressed with about 250 pounds of 0-23-30 fertilizer (home mixed) in the summer for next year's pasture. Fields to be used for hay are top-dressed in fall or spring with 8 to 10 tons of manure per acre. On the corn silage land about 240 pounds of 20 per cent superphosphate and 250 pounds of cyanamid are applied per acre at planting time. The fertilizer is broadcast and harrowed in. About 12 tons of manure per acre are plowed under just before the corn is planted.

Previous to 1940, legumes, including Ladino clover, would not thrive successfully on this farm. McDanolds knew something was lacking in the soil. In 1940 he turned to a fertilizer high in potash, namely 0-23-30. Thus potash proved to be the limiting factor for growing Ladino clover and the chief answer to the legume problem.

By the end of the first 8 years most of the 80 acres were fenced off into a number of fields. A 10 acre field was cleared of bushes and seeded down to grass, and a general pasture improvement program was started. This pasture was top-dressed annually with a 10-10-10 fertilizer.

Mr. McDanolds has a very unusual pasture-hay rotation. For generations, northeastern farmers have thought first of hay possibilities of land and then used it as pasture when it was no

longer good hayland. The process has been reversed on this farm. The new seedings are first used for pasture and then considered for hayfields. Fields seeded in March are first pastured in June. After two years of pasturing, the proportion of Ladino has gone down, timothy has increased and the red clover has almost disappeared. At this stage the percentage of timothy and Ladino seems to be in the most desirable proportion for hay harvesting. The rotation then is two years pasture and three years hay, although some corn for silage is grown the fifth year of the rotation.

During the first two weeks in May, the cows are turned out on good Ladino pasture which was seeded the previous year. The cows are out on this pasture 5 to 6 hours per day and brought in at noon. During this time they are given all the hay they will eat.

After May 15, the cows are out on pasture until September 30 or October 15, depending on the weather and conditions of pasture. During this time the grain-milk ratio is about 1-25. As the pasture season closes, the cows are gradually put back on a full time barn feeding ration at which time they are given all the hay they will consume, which is usually about 18 pounds per cow per day.

A commercial 16 per cent dairy ration is fed according to production. A cow giving 60 to 65 pounds of milk per day is given not more than 6 pounds of grain. Cows giving 40 pounds of milk will receive about 5 pounds of grain, and a cow giving 5 to 10

FACTS FROM McDANOLDS' HERD RECORDS

Year	Milk (pounds per cow)	Grain (pounds per cow)	Pounds of milk per pound of grain	Price of milk per cwt.	Value of milk per cow	Grain cost per cow	Return over grain cost per cow
1933	12,575	3,660	3.4	$1.71	$215.00	$39.00	$176.00
1934	12,395	3,138	4.0	2.20	272.00	47.00	225.00
1935	13,404	2,995	4.5	2.16	280.00	50.00	230.00
1936	14,494	3,451	4.2	1.93	279.00	57.00	222.00
1937	11,819	3,011	3.9	1.62	192.00	64.00	128.00
1938	12,477	2,599	4.8	1.67	208.00	43.00	165.00
1939	10,610	2,441	4.3	1.77	188.00	38.00	150.00
1940	11,159	1,993	*5.6	1.85	207.00	34.00	173.00
1941	12,140	2,010	6.0	2.06	250.00	37.00	213.00
1942	12,275	2,260	5.4	2.58	316.00	42.00	274.00
1943	13,080	1,220	10.7	3.02	394.00	33.00	361.00

*About here the ladino clover really began to get in its work.

pounds of milk will receive about 1½ pounds of grain. Such a cow will be about ready to turn dry. Forty pounds is about the average production for the herd. Cows are fed liberally while dry and according to production after they freshen.

There is one silo on this farm, size 14'x40', which was filled to capacity during the fall of 1944. Strange as it may seem, this supply of feed was not needed and no ensilage was fed during the barn feeding period of 1944-45. With this surplus ensilage on hand, it will not be necessary to grow any corn for silage during 1945.

Mr. McDanolds may be criticized for keeping only 20 milking cows on 80 acres of tillable land. However, most of the feed consumed by the cows is produced on the farm. He can feed so lightly on grain because his cows are given all the high quality hay they will eat. The cows never go hungry summer or winter. After all roughage needs were met on the farm, there was still a surplus of hay on hand.

In addition to the 20 cows on the farm, about 14 head of young stock are kept each year for replacements. From six months of age to freshening they are given 3 pounds of grain per day and all the hay they will eat. Counting 2 work horses, there are about 29 animal units on the 80 acre farm, or about 2.7 acres per animal unit.

In 1928, when McDanolds joined the Grafton County D.H.I.A., he fed 1 pound of grain to 2.9 pounds of milk. This farmer began to go places when he cut down the amount of grain per cow while at the same time production per cow was increasing. This trend was first noticed in 1940 when he fed 1 pound of grain to 5.6 pounds of milk; in 1941, one of grain to 6.1 of milk; in 1942, one of grain to 5.4 milk, and in 1943 one pound of grain to 10.7 pounds of milk. His Ladino-pasture-hay program was in full swing by 1943. Mr. McDanolds states that with the present roughage program he can continue to produce milk on a grain to milk ratio of about 1-10. The important thing, however, is to get enough good legume hay and enough good legume pasture for an all year quality roughage program.

Phosphorus and Plant Nutrition

Condensed from California Cultivator

R. E. Stephenson

PHOSPHORUS is a constituent of the nucleus of every living cell; therefore, there can be no growth without it in either plants or animals. In mature plants the grain contains two or three times as much phosphorus, on a percentage basis, as the straw and stalk. Since the grain is about equal in weight to the straw and stalk, the sale of grain is relatively hard on the supply of available phosphorus in the soil.

When seed is planted, growth starts by using the phosphorus stored in it, but absorption from the outside begins as soon as roots penetrate the soil. The young plant is relatively rich in phosphorus. Leaves of prune trees contained in percentage nearly twice as much phosphorus in May as a month later. The phosphorus content remained fairly constant through July and August after the leaves were mature, and then dropped about 50 per cent in September; either washed out of the old foliage by fall rains or translocated for storage in the woody tissue. Similar changes take place in young grass and other plants as they age and mature.

Young plants, therefore, are a superior source of phosphorus for the nutrition of man and animals. And young plants, such as are used for green manures, are of superior phosphorus fertilizing value. The sale of green vegetables on the other hand, may exhaust the phosphorus supply of the soil.

Though the average plant contains probably not more than one-sixth as much phosphorus as nitrogen, phosphorus deficiency in soils and in the forage grown upon the soil is common. Madsen states that no dietary deficiency of livestock is more common than that of phosphorus. Certain types of plants, legumes and the cabbage family, as examples, are rich in phosphorus and make heavy demands upon the soil. Liberal use of phosphate fertilizer tends to encourage the clovers in competition with grasses that have a lower phosphorus requirement.

Availability of phosphorus is low in very acid soils and in soils containing excessive amounts of

Reprinted by permission from the California Cultivator, May 12, 1945

lime, even though the total phosphorus content may be relatively high. Liming sour soils and the liberal use of manure on soils high in lime, may improve the phosphorus nutrition. With low availability, the only complete remedy is phosphorus fertilization.

Several fertilizers, which are suitable, include bonemeal, superphosphate, treble superphosphate, ammophos and others. Some phosphate fertilizers carry one or more elements besides phosphorus that are important to plant nutrition. Superphosphate supplies sulphur and ammo-phos supplies nitrogen, both of which are important to plant growth.

Crops usually can obtain only a small portion of the phosphorus applied as fertilizer, often one-third or less. The rate of application must, therefore, provide for this difficulty. Five tons of alfalfa would contain about the equivalent of 300 pounds of 20 per cent superphosphate. Suppose the soil were able to supply half the amount, it would leave the equivalent of 150 pounds of superphosphate to be applied as fertilizer. Actually 400 to 500 pounds of fertilizer would be needed to enable the alfalfa to obtain the desired amount.

The explanation of this difficulty and the apparent necessary excessive use of fertilizer lies in the fact that most soils fix or change the phosphate to a form that crops cannot use. Frequent wetting and drying of the fertilizer soil increases fixation. To prevent this difficulty, deep placement is desirable. Distributing fertilizer in the bottom of the furrow behind the plow has given good results in many places.

Deep placement eliminates drying and much mixing with the soil, both of which corrections are helpful in keeping the phosphate available to the crop. Plowsole placement keeps the fertilizer within easy reach of the feeding roots of well started plants. For quick stimulation of young plants in the seedling stage, row application of a portion of the fertilizer has been recommended. For most crops a band two inches to the side and two inches deeper than the seed has worked well.

While phosphate can be used alone, a complete mixture such as 6-10-4, the present Victory garden fertilizer, is better, but the same methods of placement are necessary for this type of fertilizer. The relatively high percentage (10 per cent) of phosphoric acid in the fertilizer is a recognition of both the common deficiency and the need for supplying enough phosphorus to offset, at least partially, the fixing powers of the soil.

Bees for Prosperous Agriculture

Condensed from The Ohio Farmer

W. E. Dunham

Extension Apiarist and Insect Pollination Specialist, The Ohio State University

BECAUSE of the serious sugar shortage in World War I, hundreds of people became engaged in beekeeping in an effort to produce a substitute for sugar and to benefit by the fabulous prices for honey at that time. In World War II the demand for honey has exceeded the supply and prices regulated by OPA are good. Expansion among beekeepers during this war has been conservative mainly because of the lack of labor, supplies, and the enormous increase in the acreage of non-nectar producing plants.

Thruout the intervening years between World War I and World War II important developments have occurred within the beekeeping industry. Noteworthy are the progresses made in the production of higher quality honey products, simplification of the systems of apiary management, greater utilization of package bees and queens from the south, construction of modern honey houses, increasing the efficiency of extracting equipment, standardizing honey processing, and better distribution and merchandising of honey.

Bees constitute an important agricultural asset in the pollination of crops because honeybees are the most valuable and the only pollinating insect controlled by man.

Insect Pollination of Agricultural Crops

In the plant kingdom there is a large group of plants, shrubs and trees dependent on insect pollination for their propagation. These are characterized by producing a sticky type of pollen or the flower arrangement is such that it is necessary for a flower visiting insect to transport the pollen from flower to flower on the same plant or from the flower of one plant to the flower of another plant—the latter case being termed cross-pollination.

In the progress of American agriculture many changes have occurred which have reduced the numbers of wild pollinating insects and have made agriculture more dependent on honeybees for the pollination of economic

crops. The adoption of crop rotations, more intensive cultivation and the introduction of more mechanized farm equipment has eliminated large areas of breeding grounds for such wild insects as bumblebees, solitary bees, leaf-cutting bees, flies and many other flower visiting insects. Large plantings of specialized crops such as fruits, certain vegetables, and seed crops have brought about an enormous insect pollination problem which can be solved only by the concentration of large numbers of pollinating insects in such areas.

Extensive use of honeybees is made by fruit growers in their commercial orchards. When renting bees fruit growers should insist on strong colonies, each possessing four pounds of bees and six or more frames of brood, as it is strong colonies only that will furnish dependable pollinating service during unfavorable weather conditions which so frequently prevail during the fruit blossoming period. One colony should be rented for each acre of mature fruit trees.

In commercial plantings of cucumbers, melons, cantaloupes, squashes, and pumpkins at least one colony of bees an acre is necessary. Insect pollination is essential in the production of many vegetable seeds. When producing onion seed, insect pollination should be given careful consideration. The standard accepted yield of onion seed per acre is 260 pounds. A notable case occurred in the state of Washington when a grower harvested 700 pounds of onion seed per acre when honeybees had been provided in abundance.

The most specialized phase of insect pollination is the use of honeybees in the pollination of cucumbers under glass. Because of the abnormal environment conditions within greenhouses for bees the mortality is exceptionally heavy. Honeybees also increase the seed yield of buckwheat, Dr. F. C. Swing, who owns a farm in Brown County, said that he formerly harvested from 10 to 15 bushels of buckwheat seed per acre but in recent years when commercial yards of bees were moved into his area for the buckwheat and goldenrod nectar flow, his yields per acre increased to 30 and 35 bushels.

In legume seed production high seed yields per acre are possible only when a large percent of the blossoms are pollinated by insects. So great is the pollination job that it is essential that one or more colonies be used per acre. One of the most immediate means of stepping up seed production would be the full utilization of the commercial yards of bees located in the western half of the state. A commercial yard of 60 colonies of bees at the time of

legume bloom would constitute three to five million pollinating insects. Farmers located within ¾ of a mile of commercial bee yards have a golden opportunity to harvest a large crop of clover seed, because of the concentration of a large number of pollinating insects. According to the Agricultural Outlook for 1945 legume seeds will be in great demand for use in this country and for export. To meet these requirements the amount of red clover seed in 1945 will have to be equal to that harvested in 1944, at least twice as much seed produced of Ladino, alsike and sweet clover as occurred last year, and about the same quantity of alfalfa and lespedeza seed.

Research studies have shown that honeybees are the only pollinating insects in large enough numbers to insure profitable legume seed yields. The use of legume crops constitutes the backbone of agriculture from the standpoint of livestock production and maintaining the productivity of the soil. Thus, the importance of abundant supplies of legume seed can be readily understood if we are to grow crops furnishing the most economical and highest protein forage for livestock, production of meats, dairy and poultry products. In the final analysis honeybees are one of the basic factors in the production of large quantities of cheaper nutritious foods for human consumption.

Honeybees constitute one of the basic agricultural resources in the maintenance of a prosperous agriculture. The most economical method of insuring an abundant honeybee population for the pollination of fruits, certain vegetables and seed crops is for agriculture to plan for an abundance of bee forage plants.

Farming for Permanency

"Live as if you are going to die to-morrow; farm as if you were going to live for ever"—Advice of Professor R. G. White, University College of North Wales, to Britain's equivalent of 4-H Clubs.

—*Shorthorn World*

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees — By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. (1943). $2.00.

America's Garden Book — By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons $3.50.

An Agricultural Testament—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford University Press. $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State Coll., Univ. of Minn., Mont. State Univ. College Book Company. $3.75.

Dairy Cattle Feeding and Management — Third Edition — By H. O. Henderson, Professor of Dairy Husbandry, West Virginia University. 1st Edition by Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.00.

Dairy Science — By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D.V.M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing — By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

Farm Records — By John A. Hopkins, Ph.D., Asso. Prof. of Economics, Iowa State College. Iowa State College Press. $2.50.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

Growing Tree and Small Fruits—By H. B. Knapp, Director, State Institute of Applied Agriculture, Farmingdale, Long Island, N. Y., and E. C. Auchter, Chief, Bureau of Plant Industry, U. S. D. A. John Wiley & Sons. $2.75.

How to Raise Rabbits for Food and Fur — By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Modern Agricultural Mathematics — By Maurice Nadler, B.S., A.M. Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. (1942). $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., Agricultural Writer, formerly with U. S. Dept. of Agriculture. Orange Judd Publishing Co., Inc. (1944). $4.50.

Natural Principles of Land Use—By Edward H. Graham,, Chief of the Biology Division of the Soil Conservation Service. Oxford University Press. 275 pages. $3.50.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Practical Farming for the South — By Benjamin F. Bullock, now Prof. of Rural Education, Atlanta University, Atlanta, Georgia. Univ. of North Carolina Press. $2.50.

Profitable Poultry Keeping — By H. Clyde Knandel, Prof. and Head, Dept. of Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Roots in the Earth—The Small Farmer Looks Ahead — By P. Alston Waring and Walter Magnes Teller. Harper & Bros. $2.50.

Successful Poultry Management — By Morley A. Jull, Professor and Head of Poultry Dept., University of Maryland. McGraw-Hill Book Company. $3.00.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

The American Land—Its History and Its Uses — By William R. Van Dersal, biologist in the United States Department of Agriculture. Oxford University Press. $3.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

Weeds of Lawn and Garden — By John M. Fogg, Jr., Professor of Botany, University of Pennsylvania. Published by University of Pennsylvania Press (1945). $2.50.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

INDEX

f Cattle

More Beef from Fewer Cattle ..... Nov., 1944
Beef Cattle Do Better on Silage .... Dec., 1944
Size Is Important ..... Dec., 1944
Coarse Roughage for Cattle ..... Jan., 1945
Grass Fed Steers Make Most Money . Jan., 1945
Cattle Like "Suiter's Grass" ..... Feb., 1945
Finish Young Steers with Grass and Grain, Feb., 1945
The Story of Meat ..... Feb., 1945
Need of Efficiency ..... Mar., 1945
Dark Beef ..... April, 1945
What is Type? ..... April, 1945
Breeding of Charollais Cattle ..... April, 1945
Bang's Disease Control ..... April, 1945
Grow Your Own Feed ..... May, 1945
Rodeo—A Little of Its History .... June, 1945
Gestation Periods of Five Breeds of Livestock ..... June, 1945
Phenothiazine Boosts Steer Gains .. June, 1945
This Problem of Inheritance ..... July, 1945

servation

Rebuilding Eroded Soil is a Slow Process, Aug.-Sept., 1944
Water Spreading on Range Land ... Oct., 1944
It's Producing War Food and Feed .. Oct., 1944
Man with a Bull-Tongue Scooter ... Nov., 1944
Taking Our Soils for Granted .... Nov., 1944
Soils Take a Rest ..... Dec., 1944
Undercover Farming ..... Dec., 1944
From Poverty Grass to Alfalfa .... Jan., 1945
Didn't Plow Sod Land ..... Jan., 1945
Beds for Soil Improvement ..... Feb., 1945
Terracing for Fun ..... Feb., 1945
Seed Canary Grass in Gully Control . Feb., 1945
Equipment Adapted to Contour Farming, Feb., 1945
Your Land Belongs to Tomorrow ... Mar., 1945
Take Care of the Range and the Profits Take Care of Themselves ..... April, 1945

ps

Hoeing Cotton with Fire ..... Jan., 1945
Guar, Summer Growing Legume in Arizona, Jan., 1945
Didn't Plow Sod Land ..... Jan., 1945
Sweet Potato Culture ..... Feb., 1945
Sprouted Soybeans Save Feed ..... Feb., 1945
Ladino Clover ..... Mar., 1945
Giant Blue Panic Grass ..... Mar., 1945
Blue Lupine, a Valuable Legume ... Mar., 1945
Alfalfa $8 a Ton ..... May, 1945
Save Labor in Corn Growing ..... May, 1945
An Easier Way to Harvest Hay ... June, 1945
Vacuum Cleaning Clover Seed ..... June, 1945
Potato Seed Determines Production Possibilities ..... June, 1945
The Queen of All Fibers—Ramie ... July, 1945
New Wealth from Seed ..... July, 1945
Water Cress ..... July, 1945

iry Cattle

Calf Pills—A New Feed ..... Feb., 1945
Feeding Moldy Silage ..... Mar., 1945
Pastures and Roughage ..... Mar., 1945
To Strip or Not to Strip ..... Mar., 1945
Winter Dysentery Penalizes Milk Production, Mar., 1945
The Triangle of Animal Life ..... April, 1945
Dry Dock for Cows ..... April, 1945
Bang's Disease Control ..... April, 1945
How to Select a Sire ..... April, 1945
Research in Dairy Husbandry at Ithaca, April, 1945
Saving Feed and Labor ..... May, 1945
What It Costs to Raise a Heifer .... May, 1945
Modern Trends in Dairy Cattle Nutrition, May, 1945
Self-Service for Calves ..... May, 1945
Inheritance Must Be Supplemented . May, 1945
Revolutionary Feeding Discovery .. June, 1945
Keep Them Burping ..... June, 1945
Few Bulls Become Great Sires ..... June, 1945
A Leak in Dairy Farm Profits ..... June, 1945
Gestation Periods of Five Breeds of Cattle, June, 1945
The Selection of Dairy Sires ..... July, 1945
Thyroprotein Influence on Milk Production, July, 1945
Time Studies in the Dairy Barn .... July, 1945

Farm Machinery

Electric Fence—Convenience or Hazard, Oct., 1944
Electricity Unloads the Corn Wagon . Nov., 1944
Care of Milking Machines ..... Feb., 1945
A "Sure Enough" Push Button Barn Cleaner, Mar., 1945
New Land Clearing Machine ..... Mar., 1945
Machine Co-op ..... April, 1945
Protects Metal from Rust ..... April, 1945
Tractors Cut Corn Costs ..... May, 1945
Lubrication Pays ..... July, 1945
What's New in Farm Machinery ... July, 1945

Fruit

The Farmer Must "Mobilize" the Soil, Mar., 1944
Pole Thinning of Peaches ..... Nov., 1944
Florida Has First Lychee Orchard .. Dec., 1944
Speed Sprayer Is Labor Saver ..... Dec., 1944
Reducing Apple Drop with Harvest Sprays, Jan., 1945
Controlling Field Mice in Orchards .. Jan., 1945
New Varieties of Small Fruits ..... Feb., 1945
Methods of Speeding Apple Picking . Feb., 1945
Thinning of Peaches ..... May, 1945
Soil Management in Young Orchards June, 1945
Sulfa Drug Immunizes Peach Trees . June, 1945

Fertilizers

Improved Fertility Saves Water, Aug.-Sept., 1944
Fertilizing To Make Water Go Further, Oct., 1944
The Precious Things of the Earth .. Oct., 1944
Secrets of Soil Organisms ..... Oct., 1944
Mightier Than the Mower ..... Oct., 1944
Deep vs. Shallow Tillage ..... Nov., 1944
Soils Take a Rest ..... Dec., 1944
Fertilizing for Big Yields ..... Dec., 1944
Danger in Improper Use of Fertilizers, Jan., 1945
Soil Fertility, Food Source ..... Feb., 1945
Humus, Working Partner of Plant Food, Feb., 1945
Cornstalks to the Rescue ..... Mar., 1945

INDEX

Fertilizer Makes Farm Acre Larger . Mar., 1945
How Long Do Effects from Fertilizers Last, . April, 1945
Farm Manure as a Fertilizer . . . . . April, 1945
Double-Quick Fertility . . . . . May, 1945
Balance in Plant Nutrition . . . . . May, 1945
Know Your Phosphates . . . . . May, 1945
Liming the Land . . . . . May, 1945
Maintaining Productivity . . . . . June, 1945
He Rebuilds Georgia's Soil . . . . . June, 1945
Good and Bad Health is Traced Back to Soils, . June, 1945
Plants Vary in Mineral Composition . July, 1945

Hay

Forced Ventilation Method of Curing Hay, . May, 1944
Beating a Hay Shortage . . . . . June, 1944
Mow Curing of Hay . . . . . June, 1944
Curing Hay on Tripods . . . . . Aug.-Sept., 1944
Hubam Clover a Four-Way Crop . . . Dec., 1944
Sweet Sudan in the Pasture Program . May, 1945

Hogs

Is Self-Feeding of Brood Sows Possible, . Dec., 1944
More Pork at Less Cost . . . . . Jan., 1945
Conditioning Bred Sows Sensibly . . . Feb., 1945
Hogs, Artichokes and Power . . . . . Feb., 1945
More Meat—Less Lard on the Post-War Hog, . Mar., 1945
Rye Pasture for Pigs . . . . . Mar., 1945
Breeding for Efficient Gains . . . . . Mar., 1945
Round Worms of Swine . . . . . April, 1945
Feet and Legs . . . . . April, 1945
Tilt the House, Save More Pigs . . . . May, 1945
Grow Your Own Feeds . . . . . May, 1945
Anemia in Hogs Can Be Checked . . June, 1945
Methods of a Master Producer . . . . . July, 1945

Horses

The Horse and the Law . . . . . Aug.-Sept., 1944
"Alkali Reserve" and Staying Power in Horses . . . . . Nov., 1944
Columbus Took a Chance . . . . . Dec., 1944
What Kind of Horses Do We Need? . Feb., 1945

Pastures

Good Pasture Means Greater Income, . Aug.-Sept., 1944
Pasture Poisoning . . . . . Oct., 1944
Green Pastures . . . . . Oct., 1944
Coarse Roughage for Cattle . . . . . Jan., 1945
New Pasture from Rock . . . . . Jan., 1945
Cattle Like "Suiter's Grass" . . . . . Feb., 1945
Good Pasture Management . . . . . Feb., 1945
Pasture with a Punch . . . . . Mar., 1945
To Expand the Roughage Supply . April, 1945
Sweet Sudan in the Pasture Program . May, 1945
Trends in Pasture Improving Methods, . June, 1945
New Pasture Grass, Ree Wheatgrass . July, 1945

Poultry

Pigeon Heroes . . . . . Dec., 1944
5,000 Turkeys on One Acre . . . . . Dec., 1944
Which Range System? . . . . . Jan., 1945
Handling Poultry Manure . . . . . Jan., 1945
Improved Broiler Feathering . . . . . Feb., 1945
All Pullet Flocks May Be Post-War Necessity, . Mar., 1945
Dressed Poultry . . . . . Mar., 1945
Early Hatching Pullets Pay . . . . . Mar., 1945
Spotlight on Vitamin D . . . . . Mar., 1945
Prevent Cannibalism with Manure . . Mar., 194
Meet the Situation . . . . . April, 194
The "Why and How" of Crossbreeding, . April, 194
One-Man Poultry Farm . . . . . April, 194
Poults Are Blind . . . . . May, 194
Steps Take Time . . . . . May, 194
Raising Geese at Ark Farm . . . . . May, 194
Revolutionary Feeding Discovery . . June, 194
Preventing Poultry Diseases . . . . . June, 194
Vaccinate for Protection . . . . . June, 194
Stop That "In-Between" Mortality . July, 194
Labor Short-Cuts for Poultry on Pasture, . July, 194
Growing Profitable Pullets . . . . . July, 194
How Much Should a Pullet Cost? . . . July, 194

Sheep

What is a Ram? . . . . . Dec., 194
Some Facts About Feeding . . . . . Jan., 194
Raising Sheep on Poor Feed . . . . . Feb., 194
Pheno-Thiazine Salt Mixture . . . . . April, 194
Good Sheep Don't Die in Debt . . . . . April, 194
The Montadale—A New Breed . . . . . May, 194
Lamb Pastures . . . . . June, 194
Preventing and Curing Stiff-Lamb Disease, . July, 194
Black Sheep . . . . . July, 194

Forestry

White Pine Protected from Disease . July, 194
Chemistry on a Sawdust Trail . . . . . Nov., 194
Does Farm Forestry Pay? . . . . . June, 194

Weeds

Nebraska's War on Weeds . . . . . July, 194
Beat the Weeds for More Bushels, . Aug.-Sept., 194
"2-4-D," the New Weed Killer . . . . . Mar., 194
Stop, Look and Question! . . . . . Mar., 194

Vegetables

Root-Knot Can Be Controlled . . . . . Nov., 194
Custom Potato Spraying . . . . . Dec., 194
Fertilizing for Big Yields . . . . . Dec., 194
Air Transport for Certain Crops . . . May, 194
"Any Fool Can Grow Tomatoes" . . . May, 194
Yam Drying Comes of Age . . . . . May, 194
Growing Trellis Tomatoes . . . . . June, 194
Potato Seed Determines Production Possibilities . . . . . June, 194
Tomato Pollenization . . . . . July, 194

Miscellaneous

Firesafe, Labor-saving Livestock Compound . April, 194
Why Control Prices? . . . . . April, 194
Hints for Trapping Muskrats . . . . . April, 194
Meet Sporovibrio desulfuricans . . . . April, 194
Electric Wire Fence . . . . . April, 194
Air Transport for Certain Crops . . . . May, 194
That Rascal, the Crow . . . . . May, 194
A Farmer Looks at Alaska . . . . . May, 194
Cutting Building Costs in Half . . . . June, 194
Fire Fighting Methods and Equipment, . June, 194
Before You Buy That Farm . . . . . July, 194
Time Studies in the Dairy Barn . . . . July, 194
The Queen of All Fibers—Ramie . . . July, 194
Grow Your Own Buildings . . . . . July, 194
Farm Fire Drills . . . . . July, 194
Social Security for Farmers . . . . . July, 194
Plant Breeding . . . . . July, 194
Decayed Fence Posts Unnecessary . . July, 194

THE PLANNING PAMPHLET SERIES

These pamphlets are published by the National Planning Association as a series of special reports on problems of public affairs. Below are listed the issues which we feel may be of interest to farmers because of their direct or indirect bearing on the Nation's agriculture in the Post-War period.

Single copies of the pamphlets may be obtained for 25c apiece and discounts are allowed on quantity orders. Address: NATIONAL PLANNING ASSOCIATION, 800 21st Street, N.W., Washington 4, D. C.

Titles available are:

No. 2—War and Our Latin American Trade Policy
No. 8—Guides for Post-War Planning
No. 9—Britain's Trade in the Post-War World
No. 11—For a Better Post-War Agriculture
No. 15—International Development Loans
No. 16—Regional Resource Development
No. 17—Relief for Europe
No. 18—Economic Pattern of World Population
No. 21—The Outlook for Domestic Air Transport
No. 22—The Outlook for the Railroad Industry
No. 23—Public Thinking on Post-War Problems
Nos. 25-26—World Needs for U. S. Food and Fiber (50c)
No. 28—Farm People and the Land After the War
No. 29—Food for Europe After Victory
Nos. 30-31—UNRRA: Gateway to Recovery (50c)
No. 32—The Outlook for Synthetic Rubber
No. 33—Joint Statement on Social Security
No. 34—Clothing and Shelter for European Relief
No. 36—Europe's Uprooted People: Relocation of Displaced Population
Nos. 37-38—America's New Opportunities in World Trade (50c)
No. 40—China's Relief Needs
No. 42—Fertilizers in the Postwar National Economy
No. 46—A Food and Nutrition Program for the Nation

The main objective of the National Planning Association is to study and recommend for consideration plans for coping with the future, always bearing in mind that the guiding principle is the achievement by democratic means of the highest possible material and cultural standard of living for the whole people.

Membership in the NPA is $10 a year which includes both the monthly PUBLIC POLICY DIGEST (a report on significant activities of government and private agencies), and also the PLANNING PAMPHLET SERIES.

ARE YOU KEEPING UP—

Keep up with the latest developments in your field? Here's a group of magazines that specialize in a particular subject! You'll be interested in at least one of these magazines . . . and you have the assurance that the articles are written by people who know. Send in your subscriptions today!

Farming

	Per Year
Farmer's Digest, monthly	$2.00
The Country Book, quarterly	1.00
Market (Truck) Growers Journal	1.00

Horses

Rider & Driver, monthly, horses for sport and pleasure	3.50
The Horse, bi-monthly	5.00
Thoroughbred (Horse) Record, weekly	4.00
Spokesman and Harness World, monthly	1.00

Bee Magazines

Beekeeper's Item	1.00
American Bee Journal	1.00

Livestock

Berkshire (Hog) News, monthly	1.00
Chester White World, m.	1.00
American Cattle Producer	1.00
Southeastern Cattleman	1.00
Coastal Cattleman, monthly	1.00
Pacific Stockman, monthly	1.00
The Sheepman	1.00
Arizona Stockman, monthly	1.50
Plantation Stockman, monthly	2.00

Pigeons

American Pigeon Journal, squab-fancy	1.50
Pigeon News, fancy only	1.50

Poultry

Progressive Poultryman, m.	1.00
Cackle & Crow, The Poultry-paper	1.00
Pacific Poultryman	.50
Northeastern Poultryman, 2 yrs., 24 issues	1.00

Rabbits

Calif. Rabbits Mag., m.	1.00
Calif. Rabbit News, m.	1.00
Intern. Comm. Rabbit Journal (Angoras only), m.	1.00
Small Stock (rabbits, cavies exclusively)	1.00
American Rabbit Journal	1.00

Fruit

Better Fruit, monthly	1.00
Eastern Fruit Grower	1.00

Dairying

Amer. Dairy Goat News, m.	1.00
Dairy Farmers Digest	1.00

Other Specialties

Co-operative Digest, m.	2.00
The Soybean Digest	1.50
New Agriculture (sugar beets only)	2.00
Small Commercial Animals and Fowls	.50
Modern Game Breeding, m., pheasant, wild waterfowl, etc.	2.00
Black Fox Magazine, monthly, fox, mink	2.00
Frontiers, natural history, 5 issues	1.00
Canary Journal, monthly	2.00
Natl. Amat. Mineralogist, m.	2.00
Relics, m., for Hobbyists	1.00
Good Health, m.	1.00
Canary World, m.	1.25

All magazines are monthlies except where otherwise noted; prices are for one full year. Satisfaction guaranteed. All orders are handled promptly and acknowledged. Rush your subscriptions today. Remit in any manner convenient to you.

Magazine Mart

Dept. FD, P. O. Box 1288, Plant City, Fla.

Sample Copies at Single Copy Prices

Send for FREE Catalog